Project Manual

for

SNOHOMISH REGIONAL FIRE & RESCUE

Station 83

Snohomish, WA 98290

PROJECT MANUAL - SPECIFICATIONS
June 12, 2023

Prepared for:
SNOHOMISH REGIONAL FIRE & RESCUE
Fire Chief – Kevin O'Brien
163 Village Court
Monroe, WA 98272

By:

Rice Fergus Miller
275 5th Street, Suite 100
Bremerton, Washington 98337
RFM Project No. 2020056

Section 00 0110 TABLE OF CONTENTS

END OF SECTION

SECTION 001113 ADVERTISEMENT FOR BIDS

PUBLIC NOTICE
ADVERTISEMENT FOR BIDS

Snohomish Regional Fire and Rescue
Station 83
Snohomish, WA
Project No: 2020056.00

Sealed bids will be received by Snohomish Regional Fire and Rescue up to but not later than 2:00 pm, July 11, 2023 at the address listed below, for Station 83. Bids will be opened and recorded at 2:15pm at Snohomish Regional Fire and Rescue Station 31, 163 Village Court Monroe, WA 98272.

The contract includes **site work, interior remodel, and seismic improvements.** Scope of work includes additional sleep room, new kitchen, and new restrooms. Upgrade to the HVAC system, electrical and plumbing modifications. The anticipated **base bid cost range is $800,000 to $1,000,000**, not including sales tax.

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.

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

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. Bid documents may be viewed at the following plan centers: Builders Exchange of Washington; Dodge Data and Analytics; Southwest Washington Contractors Association, Olympia

A non-mandatory pre-bid conference will be held at the Station 83, 13717 Division St, Snohomish, WA 98290 at 10:00 AM, June 20, 2023. 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.

A Bid Security must accompany each bid in accordance with the Instructions to Bidders.

Envelopes containing the sealed bids shall be marked "Bid for Snohomish Regional Fire and Rescue Station 83" and sent or delivered to:

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

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.

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.

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.

Bid Advertisement Dates: June 13, 2023
Publications: Everett Herald

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.

This notice will be posted on Snohomish Regional Fire and Rescue web site. (https://srfr.org/)

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 002113 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 83**
13717 Division Street
Snohomish, WA 98290

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

Bids will be accepted until 2:00 pm on July 11, 2023. Bids will be read aloud at 2:15 pm on July 11, 2023. 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 003100 – 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. ELEVATION CERTIFICATE
   a. Elevation Certificate, certified by William McCabe, dated 10/14/2022 (6 Page)
2. CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN
   a. Snohomish Regional Fire & Rescue Station 83, prepared by MacKay Sposito, dated September 27, 2021 (55 pages)

PART 2 PRODUCTS

A. Not Used.

PART 3 EXECUTION

A. Not Used.

END OF SECTION

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB No. 1660-0008
Expiration Date: November 30, 2022

ELEVATION CERTIFICATE

Important: Follow the instructions on pages 1–9.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION

FOR INSURANCE COMPANY USE

A1. Building Owner's Name
SNOHOMISH REGIONAL FIRE AND RESCUE

Policy Number:

A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.
13717 DIVISION STREET

Company NAIC Number:

City	State	ZIP Code
SNOHOMISH	Washington	98290

A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)
SNOHOMISH COUNTY TAX PARCEL 29062100301800

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) NON-RESIDENTIAL

A5. Latitude/Longitude: Lat. 47°58'52.7"N Long. 122°02'43.1"W Horizontal Datum: ☐ NAD 1927 ☒ NAD 1983

A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.

A7. Building Diagram Number 1B

A8. For a building with a crawlspace or enclosure(s):

a) Square footage of crawlspace or enclosure(s) N/A sq ft

b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade

c) Total net area of flood openings in A8.b sq in

d) Engineered flood openings? ☐ Yes ☐ No

A9. For a building with an attached garage:

a) Square footage of attached garage 1720.00 sq ft

b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade 0

c) Total net area of flood openings in A9.b 0.00 sq in

d) Engineered flood openings? ☐ Yes ☒ No

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number	B2. County Name	B3. State
SNOHOMISH COUNTY 535534	SNOHOMISH COUNTY	Washington

B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use Base Flood Depth)
53061C1060	F	06-19-2020	06-19-2020	AE	118.9

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9:
☒ FIS Profile ☐ FIRM ☐ Community Determined ☐ Other/Source:

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☒ NAVD 1988 ☐ Other/Source:

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☒ No

Designation Date: ☐ CBRS ☐ OPA

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 13717 DIVISION STREET			Policy Number:
City SNOHOMISH	State Washington	ZIP Code 98290	Company NAIC Number

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☒ Finished Construction

*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: WSRN Vertical Datum: NAVD88

Indicate elevation datum used for the elevations in items a) through h) below.

☐ NGVD 1929 ☒ NAVD 1988 ☐ Other/Source: _____

Datum used for building elevations must be the same as that used for the BFE.

		Check the measurement used.	
a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	120.9	☒ feet	☐ meters
b) Top of the next higher floor	129.0	☒ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☐ feet	☐ meters
d) Attached garage (top of slab)	120.9	☐ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	129.0	☒ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)	117.8	☒ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)	120.9	☒ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	117.8	☒ feet	☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☒ Yes ☐ No ☐ Check here if attachments.

Certifier's Name	License Number	
WILLIAM MCCABE	20112262	
Title PROFESSIONAL LAND SURVEYOR		
Company Name REID MIDDLETON, INC.		
Address 728 134TH STREET SW SUITE 200		
City EVERETT	State Washington	ZIP Code 98204

Signature	Date	Telephone	Ext.
William R. McCabe	10-14-22	(425) 741-3800	

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including type of equipment and location, per C2(e), if applicable)

C2(e) - HOT WATER HEATER ON THE SECOND FLOOR MOUNTED ON THE FLOOR.

PROPOSED GENERATOR PAD MIN. ELEVATION = 119.90'

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 13717 DIVISION STREET			Policy Number:
City SNOHOMISH	State Washington	ZIP Code 98290	Company NAIC Number

SECTION E – BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

For Zones AO and A (without BFE), complete Items E1–E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B,and C. For Items E1–E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

E1. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).

a) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 1–2 of Instructions), the next higher floor (elevation C2.b in the diagrams) of the building is _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E3. Attached garage (top of slab) is _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E4. Top of platform of machinery and/or equipment servicing the building is _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown. The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. The statements in Sections A, B, and E are correct to the best of my knowledge.

Property Owner or Owner's Authorized Representative's Name			
Address	City	State	ZIP Code
Signature	Date	Telephone	

Comments

☐ Check here if attachments.

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 13717 DIVISION STREET			Policy Number:
City SNOHOMISH	State Washington	ZIP Code 98290	Company NAIC Number

SECTION G – COMMUNITY INFORMATION (OPTIONAL)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8–G10. In Puerto Rico only, enter meters.

G1. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2. ☐ A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.

G3. ☐ The following information (Items G4–G10) is provided for community floodplain management purposes.

G4. Permit Number	G5. Date Permit Issued	G6. Date Certificate of Compliance/Occupancy Issued

G7. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

G8. Elevation of as-built lowest floor (including basement) of the building: _____ ☐ feet ☐ meters Datum _____

G9. BFE or (in Zone AO) depth of flooding at the building site: _____ ☐ feet ☐ meters Datum _____

G10. Community's design flood elevation: _____ ☐ feet ☐ meters Datum _____

Local Official's Name	Title
Community Name	Telephone
Signature	Date

Comments (including type of equipment and location, per C2(e), if applicable)

☐ Check here if attachments.

ELEVATION CERTIFICATE

BUILDING PHOTOGRAPHS

See Instructions for Item A6.

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 13717 DIVISION STREET			Policy Number:
City SNOHOMISH	State Washington	ZIP Code 98290	Company NAIC Number

If using the Elevation Certificate to obtain NFIP flood insurance, affix at least 2 building photographs below according to the instructions for Item A6. Identify all photographs with date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8. If submitting more photographs than will fit on this page, use the Continuation Page.

Photo One

Photo One Caption FRONT VIEW ON SEPTEMBER 23RD, 2022 — Clear Photo One

Photo Two

Photo Two Caption REAR VIEW ON SEPTEMBER 23RD, 2022 — Clear Photo Two

ELEVATION CERTIFICATE

BUILDING PHOTOGRAPHS

Continuation Page

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 13717 DIVISION STREET			Policy Number:
City SNOHOMISH	State Washington	ZIP Code 98290	Company NAIC Number

If submitting more photographs than will fit on the preceding page, affix the additional photographs below. Identify all photographs with: date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." When applicable, photographs must show the foundation with representative examples of the flood openings or vents, as indicated in Section A8.

Photo Three

Photo Three Caption RIGHT SIDE VIEW ON SEPTEMBER 23RD, 2022

Clear Photo Three

Photo Four

Photo Four Caption LEFT SIDE VIEW ON SEPTEMBER 23RD, 2022

Clear Photo Four

Construction Stormwater Pollution Prevention Plan

Snohomish Regional Fire & Rescue, Station 83
Snohomish County, WA

September 27, 2021

PREPARED FOR:
Snohomish Regional Fire & Rescue
Contact: Jamie Silva, Assistant Chief

CLIENT:
Snohomish Regional Fire & Rescue
953 Village Way
Monroe, WA 98272

MacKay Sposito
Project Number: 17715

Prepared by:
Eric Pilcher, PE
Alexander Leal

MacKay Sposito

Federal Way Office
33810 Weyerhaeuser Way South, Suite 130• Federal Way, WA 98001
253.205.8700 • info@mackaysposito.com

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Construction Stormwater Pollution Prevention Plan (SWPPP)

for

Snohomish Regional Fire & Rescue, Station 83

Prepared for:

Snohomish County, Washington

Department of Ecology, Northwest Regional Office

Permittee / Owner	Developer	Operator / Contractor
Snohomish Regional Fire & Rescue Jamie Silva, Asst. Chief 953 Village Way Monroe, WA 98272 Phone: (360) 764-7666	N/A	TBD

Snohomish County Tax Parcel 29062100301800

Erosion and Sediment Control Inspector

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Eric Pilcher, PE	MacKay Sposito 33810 Weyerhaeuser Way S Suite 130 Federal Way, WA 98001	(253) 237-7932

SWPPP Preparation Date

September 27, 2021

Project Construction Dates (Tentative)

Activity / Phase	Start Date	End Date
Station 83		

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1.0 REQUIRED CONSTRUCTION SWPPP ELEMENTS

The following are standard elements of the Construction SWPPP addressed as relevant to the work to be performed to accommodate the Snohomish Regional Fire & Rescue, Station 83 improvements. More information on listed BMPs is available in Attachment C.

Element #1: Preserve Vegetation/Mark Clearing Limits

Silt fence shall be used for demarcation of all disturbed areas and shall be installed prior to all land disturbing activities. No other BMPs are necessary because there are no critical areas on site.

Best management practices (BMPs) to be deployed include:

- BMP C233: Silt Fence

Element #2: Establish Construction Access

No BMPs are necessary because little to no vehicle traffic is expected over the disturbed areas.

Element #3: Control Flow Rates

No BMPs are necessary because the combined disturbed area is less than 7,000 square feet and new plus replaced hard surface is less than 2,000 square feet. Increased flows are not expected.

Element #4: Install Sediment Controls

Sediment from runoff produced by disturbed areas shall be captured with silt fences. No other BMPs are necessary because the combined disturbed area draining toward silt fence is less than 1.0 acre, and resulting flow rates will be less than 0.5 cfs.

BMPs to be deployed include:

- BMP C233: Silt Fence

Element #5: Stabilize Soils

Disturbed areas shall be hydroseeded. Exposed and unworked soils, including stockpiles, shall be stabilized within 7 days during the dry season (i.e., May 1 –September 30), and within 2 day days the wet season (i.e., October 1 – April 30). In addition, soils shall be stabilized by end of shift prior to holidays and weekends, as needed based on weather forecasts.

BMPs to be deployed include:

- BMP C120: Temporary and Permanent Seeding

Element #6: Protect Slopes

No BMPs are necessary because no existing slopes will be disturbed and no new slopes will be created during construction.

Element #7: Protect Drain Inlets

No BMPs are necessary because there are no existing storm drains within or adjacent to the disturbed areas.

Element #8: Stabilize Channels and Outlets

No BMPs are necessary because there are no existing conveyance systems within or adjacent to the disturbed areas and there are no temporary conveyance systems associated with this project.

Element #9: Control Pollutants

Only a limited amount of concrete work is scoped as part of this project (i.e., generator pad). Excess concrete material shall not be disposed on site, nor shall concrete handling equipment rinse water be discharged on site. *De minimis* amounts of wash water (i.e., from tool rinsing) may be generated in a contained area, collected, and transferred for off-site disposal.

Surfaces to be sawcut shall be wetted during sawing operations, and the resulting slurry shall be vacuumed and collected for off-site disposal at an appropriate site.

Small quantities of petroleum products (e.g., 5-gallon gas can, quart of oil) for use with powered hand tools may be stored on-site in a designated area, such as a Conex box. However, refueling of vehicles shall occur either off-site, or by means of a fueling service. Similarly, non-emergency vehicle maintenance (e.g., routine oil changes) shall not occur on-site. A spill kit shall be kept within the material staging area in the event that cleanup becomes necessary.

BMPs to be deployed include:

- BMP C151: Concrete Handling
- BMP C152: Sawcutting and Surfacing Pollution Prevention
- BMP C153: Material Delivery, Storage, and Containment

Element #10: Control De-Watering

No BMPs are expected to be necessary because excavation is limited to top soil strippings and shallow utility trenching where the need for de-watering is not expected. In the event that dewatering becomes necessary, the contractor shall deploy a Baker tank to collect water from excavations for off-site disposal at an appropriate site.

Element #11: Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed in order to assure continued performance of their intended function in accordance with each BMP's specifications (see Attachment C.)

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary erosion and sediment control BMPs shall be removed within 30 days after achieving final site stabilization, or after the temporary BMP is no longer needed.

Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

BMPs to be deployed include:

- BMP C150: Materials on Hand

Element #12: Manage the Project

The project is expected to be completed within a single phase.

All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Inspections and monitoring shall be performed weekly, and within 24-hours following a significant storm event.

This SWPPP shall be maintained and updated as necessary to provided continued protection. In the event that BMPs shown on the drawings or listed within this SWPPP are not sufficient, additional BMPs are necessary. If needed, additional BMPs may be selected from the SWMMWW, or be site-specific. Less than 1-acre of total area will be disturbed, therefore it is not required that site inspections be conducted by a Certified Erosion and Sediment Control Lead (CESCL). However, site inspection shall be conducted by a person who is knowledgeable in the principals and practices of erosion and sediment control. The inspector shall:

- Examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen
- Evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges
- Review the SWPPP for compliance with the 12 construction SWPPP elements and make appropriate revisions within 7 days of an inspection, if necessary
- Immediately begin the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than within 10 days of an inspection, when necessary. If installation of necessary treatment BMPs is

not feasible within 10 days, the inspector may request an extension within the initial 10-day response period.
- Document BMP implementation and maintenance in the site log book (see Attachment D)
- Inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. The inspector may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month.

A copy of this SWPPP (modified as necessary), and copies of all monitoring and inspection logs shall be maintained on site during construction activities, and made available for review by the owner, tenant, engineer, County, and Ecology, upon request.

BMPs to be deployed include:

- BMP C150: Materials on Hand
- BMP C162: Scheduling

Element #13: Protect Rain Gardens and Bioretention Systems

No BMPs are necessary because there are no existing or proposed rain gardens or bioretention systems associated with this project.

2.0 PROJECT DESCRIPTION

Snohomish Regional Fire & Rescue is planning minor site improvements for the existing Station 83 facility. Station 83 is located at 13717 Division St, Snohomish, WA 98290. It is on Snohomish County Tax Parcel 29062100301800 which has an area of 1.69 acres. A total of 0.033 acres will be disturbed and earthwork volumes will be less than 100 cubic yards. No off-site borrow or fill is anticipated. No significant changes pertaining to stormwater runoff are anticipated.

3.0 EXISTING SITE CONDITIONS

The site is currently developed with two existing buildings. Approximately one fourth of the parcel is paved asphalt, concrete, and gravel, while the remainder of the parcel is lawn. The site is mostly flat with a high point at the main fire station building. The apparatus apron and parking area slopes toward Division Street.

From Division Street, runoff flows via shallow, concentrated flow southeasterly to a roadside swale adjacent S Machias Rd. The swale is presumed to have a low point culvert crossing, allowing concentrated runoff to continue flowing southeasterly to the Pilchuck River.

4.0 ADJACENT AREAS

There are no immediately adjacent water bodies or residential areas that will be affected by site disturbance. The site fronts Division St, and is adjacent to S Machias Rd.

Runoff from the site will drain across S Machias Rd approximately 650 feet southeasterly to the Pilchuck River. (See Critical Areas, below.)

5.0 CRITICAL AREAS

The site is located within flood zone A/E per FEMA firm panel 53061C 1060F for Snohomish County, WA, Dated June 19, 2020. No fill is being placed as part of land disturbing activities that would result in a change to the established flood elevations.

6.0 SOILS

A custom soil resource report for Station 83 (Attachment B) indicates that the native soils are classified as Puget silty clay loam (mapping unit 55) and Sultan silt loam (mapping unit 66). Either type of soil may be encountered during land disturbing activities.

Puget silty clay loam is described as poorly drained and with moderately low to moderately high transmissivity (0.06 to 0.20 in/hr). It is a hydric soil with shallow depth to water table (24 to 47 inches), and is in hydrologic soil group C.

Sultan silt loam is described as moderately well drained with moderately high transmissivity (0.20 to 0.57 in/hr). It is a seasonally wet soil with shallow depth to water table (24 to 48 inches), and is in hydrologic soil group C.

7.0 EROSION PROBLEM AREAS

There are no known erosion problems on site.

8.0 CONSTRUCTION PHASING

Site improvements shall be completed in one phase.

9.0 CONSTRUCTION SCHEDULE

The following schedule is tentative. It is subject to change upon execution of a formal construction contract. The contractor's critical path management schedule and associated updates shall apply, and this SWPPP shall be modified as necessary.

Table 1. Construction Schedule

Construction Activity	Start Date	End Date
Install TESC BMPs		
Utility Installation		
Asphalt Patching		
Landscaping/Permanent Seeding		
Maintain TESC BMPs		

10.0 FINANCIAL/OWNERSHIP RESPONSIBILITIES

Snohomish Regional Fire & Rescue shall be responsible for any bonds associated with sedimentation and erosion control.

11.0 ENGINEERING CALCULATIONS

The proposed BMPs do not require calculations.

12.0 CERTIFIED EROSION AND SEDIMENT CONTROL LEAD INFORMATION

A Certified Erosion and Sediment Control Lead is not required for projects disturbing less than one acre. However, site inspection shall be conducted by a person who is knowledgeable in the principals and practices of erosion and sediment control. Contact information shall be provided after contractor selection.

Attachment A. Construction Drawings (provided with Site Development submittal)

Attachment B. Custom Soil Resource Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Snohomish County Area, Washington

Snohomish Regional Fire & Rescue - Station 83

June 11, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,050 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 22, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2018—Oct 16, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
55	Puget silty clay loam	3.0	55.4%
57	Ragnar fine sandy loam, 0 to 8 percent slopes	0.4	7.4%
66	Sultan silt loam	2.0	37.3%
Totals for Area of Interest		**5.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Snohomish County Area, Washington

55—Puget silty clay loam

Map Unit Setting

National map unit symbol: 2hzh
Elevation: 10 to 650 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 160 to 180 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Puget, drained, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Puget, Drained

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 9 inches: silty clay loam
H2 - 9 to 38 inches: silty clay loam
H3 - 38 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 47 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Available water capacity: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Forage suitability group: Soils with Few Limitations (G002XN502WA)
Other vegetative classification: Soils with Few Limitations (G002XN502WA)
Hydric soil rating: Yes

Minor Components

Puget, undrained

Percent of map unit: 5 percent
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Sultan
Percent of map unit: 4 percent
Hydric soil rating: No

Sumas, undrained
Percent of map unit: 3 percent
Landform: Flood plains
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Snohomish, undrained
Percent of map unit: 3 percent
Landform: Flood plains
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

57—Ragnar fine sandy loam, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2hzk
Elevation: 300 to 1,000 feet
Mean annual precipitation: 35 to 65 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 150 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ragnar and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ragnar

Setting
Landform: Outwash plains
Parent material: Glacial outwash

Typical profile
H1 - 0 to 2 inches: ashy fine sandy loam
H2 - 2 to 24 inches: ashy sandy loam
H3 - 24 to 60 inches: loamy sand

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

66—Sultan silt loam

Map Unit Setting

National map unit symbol: 2hzw
Elevation: 0 to 820 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sultan and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sultan

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: ashy silt loam
H2 - 12 to 42 inches: silty clay loam
H3 - 42 to 60 inches: stratified sand to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)

Hydric soil rating: No

Minor Components

Puget, undrained

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Attachment C. Construction BMPs

BMP C120: Temporary and Permanent Seeding

NOTE: Small projects permitted in accordance with SCC 30.63A.810 shall only use BMPs in this section that do not require the involvement of a licensed engineer.

Purpose

Seeding is intended to reduce erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

Between July 1 and August 30 seeding requires irrigation until 75% grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch with straw or an erosion control blanket until 75% grass cover is established.

Inspect all disturbed areas in late August to early September and complete all seeding by September 30.

Design and Installation Specifications

General

Seed shall conform to WSDOT Standard Specification 9-14.2 Seed.

Unless contradicted by information stated below, temporary and permanent seeding shall be performed in accordance with WSDOT Standard Specification 8-01.3(2) Seeding, Fertilizing, and Mulching, Sections A-F.

Final seed application is restricted to the periods April 1 through June 30 and September 1 through October 1.

Use of polyacrylamide (PAM) shall conform to the requirements of BMP C126.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions or geotextiles) which will prevent erosion.

Seed may be installed by hand or by hydroseeding. Hand seeding may be used for establishing temporary vegetation or for establishing permanent vegetation in areas less than one acre.

Apply mulch to all seeded areas, either on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seeding vegetated channels

Channels that are intended to be vegetated shall be installed before other grading on the project. Hydroseed these channels with a Bonded Fiber Matrix. For vegetated channels that receive have flows capable of eroding the channel, install erosion control blankets over hydroseed. Before allowing water to flow in vegetated channels, establish 75% vegetation cover, or install sod in the channel bottom over hydromulch and erosion control blankets.

On slopes greater than 33% use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products in accordance with the specifications set forth later in this section.

Seed mixes

The seed mixes listed in the tables below include recommended mixes for both temporary and permanent seeding. Snohomish County may approve other seed mixes.

Select a seed mix appropriate for the location, exposure, soil type, site hydrology, need for irrigation, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used.

With the exception of the wetland mix, apply seed at a rate of 120 pounds per acre.

Table 4.2 presents a seed mix appropriate for temporary vegetative cover.

Table 4.2 Temporary Erosion Control Seed Mix

	% Weight	% Purity	% Germination
Chewings red fescue or annual blue grass *Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye - *Lolium perenne*	50	98	90
Redtop or colonial bentgrass *Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover *Trifolium repens*	5	98	90

Table 4.3 presents a seed mix appropriate for landscaped areas.

Table 4.3 Landscaping Seed Mix

	% Weight	% Purity	% Germination
Perennial rye blend *Lolium perenne*	70	98	90
Chewings red fescue and red fescue blend *Festuca rubra var. commutata* or *Festuca rubra*	30	98	90

Table 4.4 presents a seed mix appropriate for dry situations where little water is required. This mix requires very little maintenance.

Table 4.4 Low-Growing Turf Seed Mix

	% Weight	% Purity	% Germination
Dwarf tall fescue (several varieties) *Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay) *Lolium perenne var. barclay*	30	98	90
Red fescue *Festuca rubra*	20	98	90
Colonial bentgrass *Agrostis tenuis*	5	98	90

Table 4.5 presents a mix recommended for bioswales and other intermittently wet areas.

Table 4.5 Bioswale Seed Mix

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	75-80	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	92	85
Redtop bentgrass *Agrostis alba* or *Agrostis gigantea*	5-10	90	80

Table 4.6 presents a low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Apply this mixture at a rate of 60 pounds per acre. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.

Table 4.6 Wet Area Seed Mix

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	98	85
Meadow foxtail *Alepocurus pratensis*	10-15	90	80
Alsike clover *Trifolium hybridum*	1-6	98	90
Redtop bentgrass *Agrostis alba*	1-6	92	85

Table 4.7 lists a meadow seed mix appropriate for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months.

Table 4.7 Meadow Seed Mix

	% Weight	% Purity	% Germination
Redtop or Oregon bentgrass *Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue *Festuca rubra*	70	98	90
White dutch clover *Trifolium repens*	10	98	90

Roughening and Rototilling:

The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.

Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizer

Use slow-release 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Do not add fertilizer to the hydromulch machine, or agitate fertilizer, more than 20 minutes before use, to prevent destruction of the slow-release coating.

Bonded Fiber Matrix (BFM) and Mechanically Bonded Fiber Matrix (MBFM)

Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre of product with approximately 10% tackifier. Achieve a minimum of 95% soil coverage during application. Install products per manufacturer's instructions. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 80% cover (100% cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, or nets/blankets. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the local authority when sensitive areas would otherwise be protected.

Approved equivalents

The Washington State Department of Ecology has approved products as able to meet the requirements of this BMP. Snohomish County may approve these products if they are used in accordance with all requirements of this BMP and all instructions and specifications provided by the manufacturer, plus additional requirements that may be established by the County.

BMP C150: Materials On Hand

Purpose

Quantities of erosion prevention and sediment control materials shall be kept on the project site at all times to be used for emergency situations such as unexpected heavy summer rains. Having these materials on-site reduces the time needed to implement BMPs when inspections indicate that existing BMPs are not meeting the SWPPP requirements.

Conditions of Use

Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric and steel "T" posts.

Materials are stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or developer could keep a stockpile of materials that are available to be used on several projects.

If storage space at the project site is at a premium, the contractor may maintain the materials at their office or yard, provided that the office or yard is less than an hour from the project site.

Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum that will cover numerous situations includes:

Material
Clear Plastic, 6 mil
Drainpipe, 6 or 8 inch diameter
Sandbags, filled
Straw Bales for mulching,
Quarry Spalls
Washed Gravel
Geotextile Fabric
Catch Basin Inserts
Steel "T" Posts

Maintenance Standards

All materials with the exception of the quarry spalls, steel "T" posts, and gravel should be kept covered and out of both sun and rain.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Proper collection, handling and disposal of process water and slurry generated during concrete sawcutting and surfacing work, and of excess concrete, prevents these materials from contaminating waters of the state.

Conditions of Use

Anytime sawcutting or surfacing operations take place, these management practices shall be utilized. Sawcutting and surfacing operations include, but are not limited to, the following:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

Slurry and cuttings shall be vacuumed during cutting and surfacing operations.

Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.

Slurry and cuttings shall not drain to any natural or constructed drainage conveyance.

Collected slurry and cuttings shall be disposed of in a manner that does not violate groundwater or surface water quality standards.

Process water that is generated during hydro-demolition, surface roughening or similar operations shall not drain to any natural or constructed drainage conveyance and shall be disposed of in a manner that does not violate groundwater or surface water quality standards.

Cleaning waste material and demolition debris shall be handled and disposed of in a manner that does not cause contamination of water. If the area is swept with a pick-up sweeper, the material must be hauled out of the area to an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions of Use

- The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.
- Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of surface ground cover leaves a site vulnerable to accelerated erosion. Construction procedures that limit land clearing provide timely installation of erosion and sedimentation controls, and restore protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

Minimize construction during rainy periods.

Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

BMP C233: Silt Fence

Purpose

A silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow. See Figure 4.21 for details on silt fence construction.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond. The only circumstance in which overland flow can be treated solely by a silt fence, rather than by a sediment pond, is when the area draining to the fence is one acre or less and flow rates are less than 0.5 cfs.

Silt fences should not be constructed in streams or used in V-shaped ditches. They are not an adequate method of silt control for anything deeper than sheet or overland flow.

Design and Installation Specifications

Use in combination with a sediment basin or other BMP.

The maximum slope steepness perpendicular to the fence line) shall be 1H:1V.

The maximum sheet or overland flow path length to the fence shall be 100 feet.

The maximum flow the silt fence shall be 0.5 cfs.

The geotextile used shall meet the standards set forth in 2008 WSDOT Standard Specifications, Section 9-33.1 Geosynthetic Material Requirements, Table 6.

Standard strength fabrics shall be supported with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Silt fence materials are available that have synthetic mesh backing attached.

Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F. to 120°F.

100% biodegradable silt fence may be left in place after the project is completed.

Refer to Figure 4.21 for standard silt fence details.

The following Standard Notes shall be included in the construction documents.

- The contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
- The silt fences shall be constructed in the areas of clearing, grading, or drainage prior to starting those activities.
- The minimum height of the top of silt fence shall be 2 feet and the maximum height shall be 2½ feet above the original ground surface.

- The filter fabric shall be sewn together at the point of manufacture, or at an approved location as determined by the Engineer, to form geotextile lengths as required. All sewn seams shall be located at a support post. Alternatively, two sections of silt fence can be overlapped, provided the contractor demonstrates to the satisfaction of the Engineer that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
- The filter fabric shall be attached on the up-slope side of the posts and support system with staples, wire, or in accordance with the manufacturer's recommendations. The filter fabric shall be attached to the posts in a manner that reduces the potential for tearing at the staples, wire, or other connection device.
- Support the filter fabric with wire or plastic mesh, dependent on the properties of the filter fabric selected for use. If wire or plastic mesh is used, the mesh shall be fastened securely to the up-slope of the posts with the filter fabric upslope of the mesh.
- Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2 inches, or a prefabricated polymeric mesh. The grab tensile strength of the mesh shall be at least 180 lbs. Polymeric mesh must have equivalent resistance to ultraviolet radiation as the filter fabric used.
- The filter fabric at the bottom of the fence shall be buried in a trench to a minimum depth of 4 inches below the ground surface. The trench shall be backfilled and the soil tamped in place over the buried portion of the geotextile, such that no flow can pass beneath the fence and scouring cannot occur. If wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the trench a minimum of 3 inches.
- Fence posts shall be placed or driven a minimum of 18 inches, provided that a minimum depth of 12 inches is allowed if topsoil or other soft subgrade soil is not present and a minimum depth of 18 inches cannot be reached. Fence post depths shall be increased by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
- Silt fences shall be located on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.
- If the fence must cross contours, with the exception of the ends of the fence, a gravel check dam placed perpendicular to the back of the fence shall be used to minimize concentrated flow and erosion along the back of the fence. The gravel check dam shall be approximately 1-foot deep at the back of the fence. The dam shall be continued perpendicular to the fence at the same elevation until the top of the dam intercepts the ground surface behind the fence. Gravel check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Gravel check dams shall be located every 10 feet along the fence where the fence must cross contours. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
- Wood, steel or equivalent posts shall be used. Wood posts shall have minimum dimensions of 2 inches by 2 inches by 3 feet minimum length, and shall be free of defects such as knots,

splits, or gouges. Steel posts shall consist of either size No. 6 rebar or larger, ASTM A 120 steel pipe with a minimum diameter of 1-inch, U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft. or other steel posts having equivalent strength and bending resistance to the post sizes listed. The spacing of the support posts shall be a maximum of 6 feet.

- Fence back-up support, if used, shall consist of steel wire with a maximum mesh spacing of 2 inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to ultraviolet radiation as the geotextile it supports.

Refer to Figure 4.22 for slicing method details. Install silt fence using the slicing method specification details follow.

- The base of both end posts must be at least 2 to 4 inches above the top of the silt fence fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
- Install posts 3 to 4 feet apart in critical retention areas and 6 to 7 feet apart in standard applications.
- Install posts 24 inches deep on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure.
- Install posts with the nipples facing away from the silt fence fabric.
- Attach the fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1 inch vertically apart. In addition, each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
- Wrap approximately 6 inches of fabric around the end posts and secure with 3 ties.
- No more than 24 inches of a 36-inch fabric is allowed above ground level.
- The installation should be checked and corrected for any deviation before compaction. Use a flat-bladed shovel to tuck fabric deeper into the ground if necessary.
- Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips.

Maintenance Standards

Repair damaged or deteriorated silt fence immediately

If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment pond.

Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.

Sediment deposits shall either be removed when the deposit reaches approximately one-third the height of the silt fence, or a second silt fence shall be installed.

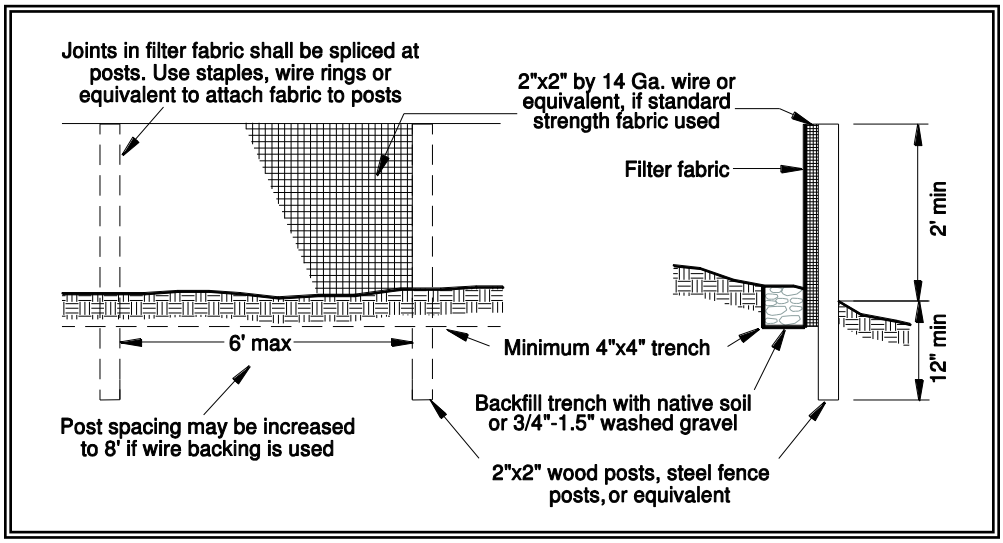

Figure 4.21 Silt Fence

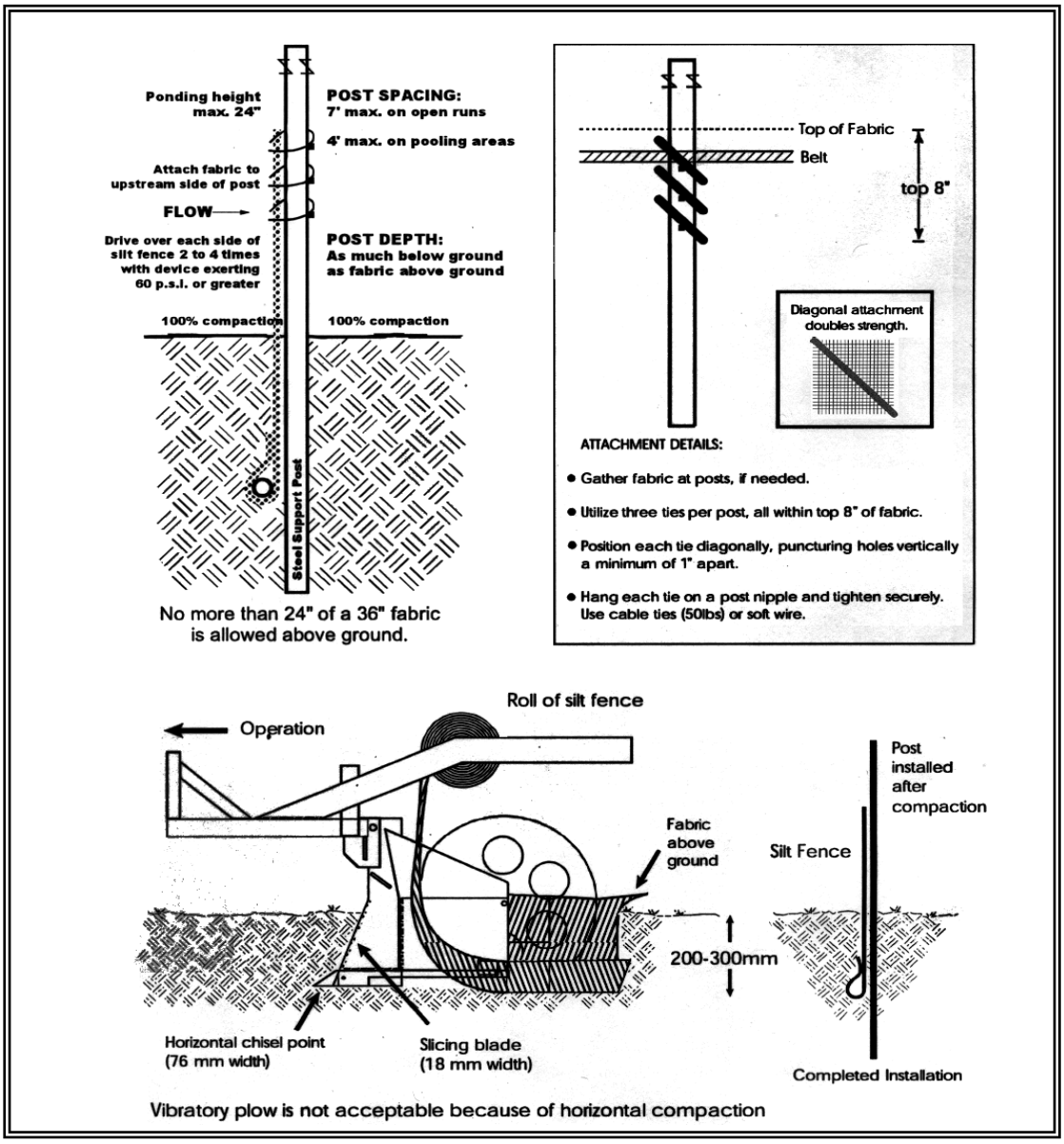

Figure 4.22 Silt Fence Installation by Slicing Method

Attachment D. Construction Stormwater Site Inspection Form

Construction Stormwater Site Inspection Form

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre-Construction/Install TESC BMPs	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

_____

_____

_____

_____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: _____

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

Construction Stormwater Site Inspection Form

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) _____ (Signature) _____ Date: _____

Title/Qualification of Inspector: _____

SECTION 004113 BID FORM

SNOHOMISH REGIONAL FIRE & RESCUE
STATION 83

BID/PROPOSAL

Contractor: _____

City: _____, Washington

Date: _____, 2023

TO: Snohomish Regional Fire and Rescue

ADDRESS: 163 Village Court, Monroe, WA

I have received Bid Documents titled Station 83 dated, June 12, 2023
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 83, 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 83

_____ 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.

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 245 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 83 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 83

13717 Division Street
Snohomish, WA 98290
(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 _____, 2022.

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): SNOHOMISH REGIONAL FIRE & RESCUE

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. Rebar Install:_____

END OF SECTION

SECTION 005200 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-Three »
(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 83 »
«13717 Division Street »
« Snohomish, WA 98290»

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 83 »
« »

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.

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§ 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 007200 – GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.1 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.

1.2 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 83 »
« »

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.

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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:

[2.3.6 The 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

3.4.4.1 The Washington State Department of Labor and Industries Prevailing Wage Rates are part of the Contract.

3.4.4.2 It is the Contractor's responsibility to follow the Prevailing Wage rates in effect as of the Bid date.

3.4.4.3 No 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).

3.4.4.4 Any 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.

3.4.4.5 The Owner reserves the right to perform wage rate interviews and/or require Contractor submission of certified payrolls for all Contractor and Subcontractor personnel.

3.4.4.6 Contractor 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 011000 – SUMMARY OF WORK

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. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished Owner-installed products.
6. Owner-furnished, Contractor-installed products.
7. Access to site.
8. Work restrictions.
9. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Snohomish Regional Fire & Rescue – Station 83.

1. Project Location: 13717 Division St, Snohomish WA 98290.

B. Owner: Snohomish County Fire District 7; 163 Village Court, Monroe, WA 98272.

1. Owner's Representative: Ron Rasmussen**,** Deputy Chief of Facilities / Logistics; (360) 794-7666.

C. Architect: Rice Fergus Miller; 275 Fifth St, Suite 100, Bremerton WA 98337; (360) 377-8773.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Related site work includes, replace existing discharge line, replace oil/water separator and asphalt/concrete sawcut demolition and repair.
   2. Related interior work includes one new sleep room, new kitchen, 2 new restroom and a radio desk.
   3. Replacing existing HVAC with new.
   4. Replacing existing interior generator with new exterior generator.
   5. Plumbing, Electrical power and lighting upgrades and Seismic improvements.
   6. Other Work indicated in the Contract Documents.

B. Type of Contract:

   1. Project will be constructed under a single prime contract.

1.5 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.

1.6 WORK PROVIDED BY OWNER UNDER SEPARATE CONTRACT

A. The following work will be performed by Owner using Owner-provided contractors or forces, concurrently with the Work of this Contract:

   1. Source capture exhaust system.

1.7 OWNER-FURNISHED OWNER INSTALLED PRODUCTS

A. Owner will furnish products indicated. The Work includes coordination with Owner-provided contractors or forces for installation of products.

   1. TV & computers.
   2. All non-built in furniture such as desks, chairs, beds, and night stands.
   3. Shower curtain & shower curtain rings.

1.8 OWNER-FURNISHED CONTRACTOR-INSTALLED PRODUCTS

A. Owner will furnish products indicated contractor to installed. The Work includes coordination with Owner-provided contractors or forces for installation of products.

   1. Toilet Accessories indicated with (OFCI) listed in Schedule. See Section 102800 “Toilet, Bath and Laundry Accessories”.
   2. Window Blinds.

1.9 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas within limits of construction identified on the drawings.
2. Driveways, Walkways and Entrances: Keep driveways, parking area, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 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. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Any time permitted with prior arrangements and assigned access cards to be provided by Owner.
2. Early Morning Hours: Make prior arrangements with Owner before proceeding.
3. Hours for Utility Shutdowns: Coordinate with owner for a mutually agreeable time.
4. Hours for noisy activity: Same as business hours noted above.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

2. Owner may require daily roster of employees on site due to sensitivity of existing tenant activities.

G. Employee Identification: Owner will provide identification badges to allow access on site and coordinate security measures to maintain confidentiality of tenant occupants on site.

1.11 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 published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

B. Substitution Request Form

1.02 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
      a. Submit physical samples, if requested.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Section 00 2113 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

C. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):

1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

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

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

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

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

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 administrative and procedural requirements for handling and processing Contract modifications.

1.3 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.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a 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 20 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."

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 Division 01 Section "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."

1.5 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.

1.6 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 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 012600

SECTION 012900 - PAYMENT PROCEDURES

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 administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 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.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

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.

B. Format and Content: Use Project Manual table of contents and specifications noted on Drawings 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. Contractor's name and address.
    d. 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.

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.

1.5 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. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. 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.

E. 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.

F. Transmittal: Submit one signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. The 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.

G. 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.

H. 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.

I. 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.

J. 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 liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 -

PART 2 - GENERAL

2.1 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.

2.2 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 meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

2.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

2.4 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. 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.

C. 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.

D. 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.

2.5 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. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. 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.

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 seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 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 Division 01 Section "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 10 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 weekly.

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.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

2.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

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: Schedule and conduct a preconstruction conference and jurisdictional conferences 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, 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. Critical work sequencing and long-lead items.
c. Designation of key personnel and their duties.
d. Lines of communications.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.

h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Preparation of record documents.
l. Use of the premises and existing buildings.
m. Work restrictions.
n. Working hours.
o. Owner's occupancy requirements.
p. Responsibility for temporary facilities and controls.
q. Procedures for moisture and mold control.
r. Procedures for disruptions and shutdowns.
s. Construction waste management and recycling.
t. Parking availability.
u. Office, work, and storage areas.
v. Equipment deliveries and priorities.
w. First aid.
x. Security.
y. Progress cleaning.

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. Deliveries.
e. Submittals.
f. Possible conflicts.
g. Compatibility requirements.
h. Time schedules.
i. Weather limitations.
j. Manufacturer's written instructions.
k. Warranty requirements.
l. Space and access limitations.
m. Testing and inspecting requirements.
n. Installation procedures.
o. Coordination with other work.
p. Required performance results.

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 60 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 preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.
    h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    i. Submittal procedures.
    j. Owner's partial occupancy requirements.
    k. Installation of Owner's furniture, fixtures, and equipment.
    l. Responsibility for removing temporary facilities and controls.

4. Minutes: Contractor conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at bi-weekly intervals.

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.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity 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 bi-monthly 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 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

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) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) 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 3 - PRODUCTS (Not Used)

PART 4 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Daily construction reports.
3. Material location reports.
4. Site condition reports.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 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. 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.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
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.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
1. PDF copy is acceptable.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. 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

2.1 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. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. 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.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. 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.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Sitework
    b. Structural completion.
    c. Permanent space enclosure.

d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. 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.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project or other mutually agreed program.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing.
    j. Punch list and final completion.
    k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.

7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.3 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. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly 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, 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 013200

SECTION 013300 - SUBMITTAL PROCEDURES

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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals if desired.

B. General: At Contractor’s written request, copies of the Architect’s electronic drawing files will be provided to Contractor for Contractor’s use in connection with Project, subject to the following conditions:

1. The Architect’s and Architect’s consultants’ files will be issued only after the Architect’s Electronic Data Information File Release Form is executed and returned to the Architect. A sample of this form is attached to this Section: see Attachment A.

2. CAD files from the Architect’s consultants may be provided at the discretion of the consultant and is subject to execution of the consultant’s electronic file release form, if any, in addition to the Architect’s release form

3. Drawing files will be provided in AutoCad .dwg files only. Contractor shall allow a minimum of five working days after receipt of the executed Electronic Data Information File Release Form for the Architect to provide the files.

4. Files of details will not be provided. The following digital data files may be furnished for each appropriate discipline:
    a. Floor Plans
    b. Reflected Ceiling Plans
    c. Roof Plans
    d. Building Sections

C. 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.

D. 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 15 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 15 days for review of each resubmittal.

E. Identification & Information: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.

h. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

4. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Use AIA Document G810.

F. Options: Identify options requiring selection by Architect.

G. 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.

H. 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.

I. 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.

J. 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

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Provide a submittal for each product section and division. PDF File format is acceptable in lieu of paper copies.

1. Action Submittals: Submit electronic copy of each submittal unless otherwise indicated.
2. Informational Submittals: Submit electronic copy of each submittal unless otherwise indicated.
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. Electronic copy of Product Data unless otherwise indicated.

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 30 by 42 inches.
3. Submit Shop Drawings in the following format:
    a. PDF format.

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. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Submit copies to Owner, Architect, and Jurisdictions Having Authority for review.

G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

H. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

I. 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.

J. 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.

K. 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.

L. 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.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. 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.

P. 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.

PART 3 - EXECUTION

3.1 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 Division 01 Section "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.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. 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.

C. 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.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

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 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.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 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; to

demonstrate compliance with approved codes and code approved installation methods; and specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged for acceptance.

1. Integrated Exterior Mockups: Mockups of the exterior opening flashing at doors, windows, and sectional doors.

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.

1.4 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.

1.5 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. 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.

D. 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.

1.6 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 reinspection.

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.

1.7 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. 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. Mockups to be built and approved prior to start of exterior envelope construction.
2. Mockups to be built separate and away from any in-place construction.
3. Build sample mockups from building location as shown on attachment at the end of this section. A min location and of size indicated or, if not indicated, as directed by Architect.
4. The mockup shall be shown in various phase of construction including but not limited to framing, all exterior envelope barriers, application of flashing at system, material and product terminations, interruptions and projections through the exterior envelope.
5. Notify Architect seven days in advance of dates and times when mockups will be constructed.
6. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
7. Demonstrate the proposed range of aesthetic effects and workmanship.
8. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    a. Allow 5 days for initial review and each re-review of each mockup.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups that are not integrated into the Work when directed unless otherwise indicated.

G. 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.

1.8 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. Costs for retesting and reinspection of construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
3. Special Inspections required by IBC requirements that indicated on the following:
    a. Structural Drawings “Special Inspection Schedule”.
    b. Architectural Drawings “Special Inspections”

4. Commissioning required by IBC requirements indicated on the following:
   a. Mechanical Drawings “Commissioning Notes”

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 Division 01 Section "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/Reinspection: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspection of 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. As provided by Owner.

3.2 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.

3.3 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 Division 01 Section "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 014000

SECTION 014200 - REFERENCES

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 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.

1.3 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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 requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 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 engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

1.5 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 United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 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

2.1 MATERIALS

A. 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.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E84 and passing NFPA 701 Test Method 2.

C. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Coordinate needs with Owner. Space on site is limited. Not required.

B. Storage and Fabrication Sheds: Coordinate needs with Owner. Space on site is limited. Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations, as needed.

1. Store combustible materials apart from building.

C. Provide Portable Toilet Facilities. Provide portable toilet and washing facilities for all workers on site for this project. Provide enough quantity and maintain in clean and sanitary condition.

D. Provide temporary protection of all finished surfaces along ingress and egress routes to work areas, including exterior walks, paving, and site furnishings.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities 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.

3.2 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.

3.3 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: 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.

D. 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.

1. Toilets: Use of Owner's existing toilet facilities will not be permitted.

E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

F. 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.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241. Coordinate needs with Owner prior to construction.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated parking areas to be identified by Owner for construction personnel. Coordinate quantity and size of vehicles with Owner.

D. 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."

E. 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.

F. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner and maintained free and clear at all times for emergency egress and life safety of building occupants. 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.

3.5 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.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

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 011000 "Summary."

C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

F. 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. Comply with additional limits on smoking specified in other Sections.
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.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water 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.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect exposed roof sheathing from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Remove standing water from roof deck and other materials.
4. Keep roof deck openings covered or dammed.

3.7 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. Maintenance: Maintain facilities in good operating condition until removal.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. 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. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

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 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. Division 01 Section "Substitution Procedures" for requests for substitutions.
   2. Division 01 Section "References" for applicable industry standards for products specified.

1.3 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.

1.4 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 one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in section 01330- "Submittal Procedures." and section 01330-A, Attachment A.
    b. Use product specified if Architect does not approve request or 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 01330- "Submittal Procedures." Show compliance with requirements.

1.5 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.

1.6 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.

1.7 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 Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 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. Products: 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.

2. 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 be considered.

C. 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.

2.2 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. Refer to section 012500- “Substitution Procedures” for requirements regarding product substitution requests.

2. Submit written 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.

3. Submit 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.
4. Submit evidence that proposed product provides specified warranty.
5. Submit a list of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Submit samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

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 general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field Engineering
   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.
   9. Correction of the Work.

B. Related Requirements:

   1. Division 01 Section "Summary" for limits on use of Project site.

1.3 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.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

   1. 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.

2. 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.

3. 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.

4. 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.

1.5 QUALIFICATIONS

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

2.1 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

3.1 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. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 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. General: Engage a **land surveyor** to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

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.

3.3 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.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by a land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

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."

3.4 PREPARATION

A. Existing Utility Information: Furnish information to local utility, or 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 013100 “Project Management and Coordination”.

3.5 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. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. 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.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. 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.

H. 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.

I. 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.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 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. 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 Division 31 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.

F. 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.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 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.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. 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.
2. 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.

3. 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. 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.

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.

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.

3.9 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.

3.10 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 017300

SECTION 017700 - CLOSEOUT PROCEDURES

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 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.

B. Related Requirements:

1. Division 01 Section "Execution" for progress cleaning of Project site.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance Material Items: Provide items in accordance with the related Section.

1.6 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. 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.

1.7 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 Division 01 Section "Payment Procedures."
2. 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.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

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.

1.8 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.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 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.

PART 3 - EXECUTION

3.1 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.

2. Clean the following items disturbed by construction activities:

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. 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.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Seal resilient flooring with manufacture recommend clear polish/sealer in the manufacturer recommended number of coats for high traffic, commercial use.
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. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
m. Leave Project clean and ready for occupancy.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

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 administrative and procedural requirements for preparing operation and maintenance manuals.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 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. Architect 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. Final Manual Submittal: Submit three copies of each manual and one electronic PDF file 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 Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR 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. 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, 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. 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. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
4. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

K. 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

3.1 MANUAL PREPARATION

A. 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.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

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 administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.

B. Related Requirements:
1. Division 01 Section "Execution" for final property survey.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 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. Final Submittal:

1) Submit two paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and two set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and 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 and 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

2.1 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. 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. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 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 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 and one.

PART 3 - EXECUTION

3.1 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 017839

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Work Restrictions.

B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

D. Section 01 7000 - Execution: Cutting & Patching, Field Engineering,

E. Section 31 1000 - Site Clearing: Removal of site items.

F. Section 31 2000 - Earth Moving: Exacavation & backfill.

PART 3 EXECUTION

2.01 SCOPE

A. Remove other items indicated, for salvage, relocation, and recycling.

B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2200.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

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

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

E. Hazardous Materials:

1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

2.03 EXISTING UTILITIES

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

B. Protect existing utilities to remain from damage.

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

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

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

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

2.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

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

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

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Slab on grade.
   2. Below Grade Concrete
   3. Concrete Exposed to Weather

B. Related Sections:

   1. See Notes on drawings for additional information and requirements.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

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

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete".
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, C595, Type II, gray. Supplement with the following:

a. Fly ash: ASTM C618, Class F or C.

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2.5 CURING AND SEALING MATERIALS

A. Water: Potable.

B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

C. Basis of Design: Dayton Superior; Cure & Seal 25% J22UV, or equal approved by Architect.

2.6 VAPOR BARRIERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Chamfer edges of permanently exposed concrete.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.5 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to all concrete surfaces.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

C. Slab Finishes: Match existing adjacent slab finish at all interior and exterior patched locations. Provide steel trowel finish at all new slabs.

3.6 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Maintain continuity of coating and repair damage during curing period.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports. See structural drawings for additional inspection requirements.

B. Inspections:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 061000 – ROUGH CARPENTRY

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. Wood blocking and nailers.
   2. Plywood sheathing.
   3. Framing with dimension lumber.

B. Related Requirements:

   1. See general structural notes in structural drawings for additional information and requirements.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

   1. NLGA: National Lumber Grades Authority.
   2. WCLIB: West Coast Lumber Inspection Bureau.
   3. WWPA: Western Wood Products Association.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

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

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

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and the following species unless noted otherwise in the structural notes and drawings:

1. Douglas fir-larch; WCLIB or WWPA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades unless otherwise noted in the structural notes and drawings:

1. Douglas fir-larch; Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 3 grade.
1. Application: All interior partitions.
2. Species:
   a. Douglas fir-larch; WCLIB, or WWPA.

B. Structural Framing:
1. Application: Studs and plates for shear wall strengthening; studs and posts for holdown installation, joists for framing around new openings, blocking for diaphragm and shear wall nailing, blocking for metal strap installations.
2. Species: Refer to structural drawings
3. Grade: Refer to structural drawings

2.5 FASTENERS

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

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

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

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

K. Verify laundry equipment dimensions & properly layout the wall framing.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood casings / trims at window & louver openings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 09 9123 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Casings / tirms at exterior window & louver openings: Field verify to match existing or poplar..

2.02 FASTENINGS

A. Fasteners: Of size and type to suit application.

2.03 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.04 SITE FINISHING MATERIALS

A. Field Finishing: See Section 09 9123.

2.05 FABRICATION

A. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9123.

END OF SECTION

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 09 9123 - Interior Painting: Field finishing of cabinet exterior.

C. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets at Per Plan:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Decorative laminate
   4. Finish - Concealed Surfaces: Manufacturer's option.
   5. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
   6. Door and Drawer Front Retention Profiles: Fixed panel.
   7. Casework Construction Type: Type A - Frameless.

8. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
9. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
    a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
10. Cabinet Design Series: As indicated on drawings.
11. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
12. Cabinet Style: Flush overlay.
13. Cabinet Doors and Drawer Fronts: Flush style.
14. Drawer Side Construction: Multiple-dovetailed.
15. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
    1. Wilsonart LLC: www.wilsonart.com/#sle.
    2. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Countertops: See Section 12 3600.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Adjustable Drawer Organization Systems: Drawer trays, dividers, and connectors.
    1. Products:
        a. Blum, Inc; AMBIA-LINE; www.blum.com/#sle.
        b. Blum, Inc; ORGA-LINE; www.blum.com/#sle.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Metal Z-Shaped Wall Cabinet Support Clips: Paired, cleated, structural anchorage components applied to back of cabinets and walls for wall cabinet mounting.

C. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

D. Fixed Specialty Shelf Supports:
    1. Material: Steel.
    2. Color: White.
    3. Products:
        a. A&M Hardware, Inc; Floating Brackets: www.aandmhardware.com/#sle.
        b. Substitutions: See Section 01 6000 - Product Requirements.

E. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.

1. Materials: Steel plates.
2. Color: Selected by Architect from manufacturer's standard range.
3. Products:
    a. Rakks/Rangine Corporation; Inside Wall Flush Mount Brackets: www.rakks.com/#sle

F. Fixed Standard Shelf, Countertop, and Workstation Brackets:
1. Material: Steel.
2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
3. Products:
    a. A&M Hardware, Inc; Standard Brackets: www.aandmhardware.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

G. Vanity Brackets: Fixed, ADA-compliant, face-of-stud mounting.
1. Material: Steel.
2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
3. Color: White.
4. Products:
    a. Rakks/Rangine Corporation; ADA Compliant EHV Vanity Supports: www.rakks.com/#sle.

H. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers ("U" shaped wire pull, steel with chrome finish, 100 mm centers).

I. Drawer Slides:
1. Type: Extension types as indicated.
2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.
6. Manufacturers:
    a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
    b. Blum, Inc; MOVENTO: www.blum.com/#sle.
    c. Blum, Inc; TANDEM: www.blum.com/#sle.
    d. Blum, Inc; STANDARD: www.blum.com/#sle.
    e. Sugatsune America, Inc: www.sugatsune.com/#sle.
    f. Substitutions: See Section 01 6000 - Product Requirements.

J. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
1. Manufacturers:
    a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle.
    b. Blum, Inc; COMPACT BLUMOTION: www.blum.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

K. Hooks: Surface-mounted; stainless steel, satin finish.
1. Manufacturers:
    a. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
    b. Sugatsune America, Inc: www.sugatsune.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.07 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

3.03 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.04 SCHEDULES

A. Refer to drawing sheet A60.01, Finish Legend.

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Panolam Industries International, Inc; Panolam FRP: www.panolam.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
   2. Panel Thickness: 0.09 inch (2.3 mm).
   3. Surface Design: Embossed.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
E. Install panels with manufacturer's recommended gap for panel field and corner joints.
F. Place trim on panel before fastening edges, as required.
G. Fill channels in trim with sealant before attaching to panel.
H. Install trim with adhesive and screws or nails, as required.
I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

1.03 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.02 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Formaldehyde Content: Zero.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

D. Enclosure for Recessed Ceiling Fixtures: Mineral fiber insulation box enclosure with foil facing on exterior side for placement over recessed ceiling light fixture; flame spread index of 25 (twenty five) and smoke development index of 0 (zero) when tested in accordance with ASTM E84.
   1. Light Fixture Size: As indicated on drawings.
   2. Insulation Thickness: 1-1/4 inch (31.8 mm), nominal.
   3. Thermal Resistance: R-value (RSI-value) of 4.2 (0.74) per inch, minimum, at 75 degrees F (24 degrees C), minimum, when tested according to ASTM C518.

2.03 ACCESSORIES

A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mil, 0.012 inch (0.30 mm) thick.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.

PART 3 EXECUTION

3.01 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (152 mm) on center. Lap and seal sheet retarder joints over face of member.

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

END OF SECTION

SECTION 07 4633
PLASTIC SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic siding and trim.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Siding substrate.

1.03 REFERENCE STANDARDS

A. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding; 2017.

B. VSI (INST) - Vinyl Siding Installation Manual; 2017.

1.04 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used.

B. Samples: Provide samples in colors specified, not less than 12 inches (305 mm) in length.

C. Color Samples: Where colors are not specified, provide samples of manufacturer's entire color line for selection.

D. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Not less than three years of experience with products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. General Requirements:
   1. Siding: Complying with ASTM D3679.

B. Horizontal Plastic Siding, Type Match Existing:
   1. Thickness: 0.038 inch (0.97 mm), minimum.
   2. Length: 12 feet (3.658 m), minimum.
   3. Nailing Hem: Single layer, with 1-1/8 inch (28 mm) long nail holes at maximum 18 inch (457 mm) on center.
   4. Finish: Match Existing.
   5. Color: As selected by Architect from manufacturers standard range of available colors.

2.02 ACCESSORIES

A. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation even when not specifically indicated on drawings.
   1. Color: Match adjacent siding or soffit panels.
   2. Profiles: Provide types as indicated on drawings.

B. Fasteners: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 psi (434 MPa); length as required to penetrate framing at least 3/4 inch (19 mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.

B. Do not proceed with installation until unacceptable conditions have been corrected.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install siding and trim in accordance with manufacturer's printed installation instructions and VSI (INST).

B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.

C. Clean dirt from surface of installed products, using mild soap and water.

3.03 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

END OF SECTION

SECTION 08 1213
HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames for non-hollow metal doors.

B. Fire-rated hollow metal frames for non-hollow metal doors.

1.02 RELATED REQUIREMENTS

A. Section 08 1416 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.

B. Section 08 7100 - Door Hardware: Hardware, silencers, and weatherstripping.

C. Section 09 9123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2020.

G. 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.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

M. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

P. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

Q. UL (DIR) - Online Certifications Directory; Current Edition.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Manufacturer's Qualification Statement.

E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames with Integral Casings:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Refer to Door and Frame Schedule on drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.

B. Door Frame Type: Provide hollow metal door frames with _____.
   1. Exterior Doors: Use frames with integral casings.
   2. Interior Doors: Use frames with integral casings.
   3. Interior Doors: Use frames with applied casings.

C. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.

D. Accessibility: Comply with ICC A117.1 and ADA Standards.

E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.

F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

A. Frame Finish: Factory finished.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

C. Fire-Rated Door Frames: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
   3. Provide units listed and labeled by ITS (DIR) or UL (DIR).
      a. Attach fire rating label to each fire rated unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 7100.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.5 mm) measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 1213 - Hollow Metal Frames.

B. Section 08 7100 - Door Hardware.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

C. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Masonite Architectural: www.architectural.masonite.com/#sle.
   2. Oregon Door: www.oregondoor.com/#sle.
   3. VT Industries, Inc: www.vtindustries.com/#sle.
   4. Lynden Door: www.lyndendoor.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. Color: As selected by Architect.
      b. Sheen: Match existing.

2.06 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1213.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling mounted access units.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

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

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Ceiling-Mounted Units:
   1. Location: As indicated on drawings.
   2. Size: As indicated on the drawing.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Trimless, flush type.

2.02 CEILING MOUNTED ACCESS UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Flush Access Door for Drywall: DW-5040.
   2. Best Access Doors: www.bestaccessdoors.com/#sle.
      a. General Purpose Drywall Access Door with Mud in Flange: Series BA-AHD-GYP
   3. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 5313
VINYL WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl-framed, factory-glazed windows.

B. Operating hardware.

1.02 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2017.

1.03 SUBMITTALS

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

B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements, and section details.

D. Samples: One sample showing window frame section.

E. Operating Hardware: One samples of each type of operating hardware.

F. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

G. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing of type specified and with at least three years documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a 5-year period after Date of Substantial Completion.

C. Manufacturer's Warranty: Provide five-year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of vinyl color finish. Complete form in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vinyl Windows:
   1. VPI Quality Windows; Endurance Series: www.vpiwindows.com/endurance-series.php
   2. Innotech Windows and Doors; Defender 76TS System: www.innotech-windows.com/#sle.
   3. Pella Corporation; Encompass by Pella Vinyl Windows: www.pellacommercial.com/#sle.

4. Prime Window Systems, LLC; Silent Guard Acoustic Series 7000: www.primewindowsys.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESCRIPTION

A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings.
      a. Product Type: C - Casement window in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
   2. Color: White, Match Existing.
   3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
   4. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
   5. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
   6. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.
   7. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
   8. Product to comply with 2018 Washington State Building Code, Section 1030 Emergency Escape and Rescue.

2.03 COMPONENTS

A. Glazing: Insulated double pane, annealed glass, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions and acoustic rating indicated.

B. Frame Depth: 2-11/16 inches (68.3 mm).

C. Accessories: Provide related flashings, anchorage and attachment devices as necessary for full assembly.

2.04 HARDWARE

A. Casement/Awning Sash: Steel rotary arm sash operating mechanism with fold-down handle and two bar adjustable hinges and keepers fitted to projecting sash arms with limit stops.

B. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive this work.

3.02 INSTALLATION

A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.

C. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.

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)	Best, Sargent
Electric Strikes	Von Duprin (VON)	Trine, SDC
Power Supplies	Von Duprin (VON)	Precision, Sargent
Cylinders & Keying	Schlage (SCH)	Best, Sargent
Door Closers	LCN (LCN)	Norton 9500, Sargent 281
Automatic Operators	LCN (LCN)	Norton, Besam
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.

3.06 DOOR HARDWARE GROUPS

↯ = Hardware Item Requiring Electrical Coordination

HW SET: 00

1			EXISTING HARDWARE TO REMAIN			

HW SET: 01

3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PRIVACY INDICATOR LOCK	L9056T 17A 09-544 L283-722		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 01A

3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PRIVACY INDICATOR LOCK	L9056T 17A 09-544 L283-722		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 02

3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PRIVACY INDICATOR LOCK	L9056T 17A 09-544 L283-722		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR BOTTOM	369AA		AA	ZER

HW SET: 03

3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	ROLLER BUMPER	RB470		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

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

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. As indicated in Mechanical Drawing.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.

B. Stationary Louvers, Type L-: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: 50 percent, minimum.
   2. Blades: Drainable.
   3. Frame: 4 inches (100 mm) deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gauge, 0.0808 inch (2.05 mm) minimum; blades 12 gauge, 0.0808 inch (2.05 mm) minimum.
   5. Aluminum Finish: Superior performing organic coatings; finished after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).

B. Color: As selected from manufacturer's standard colors.

2.05 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch (1.63 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.

C. Fasteners and Anchors: Stainless steel.

D. Head and Sill Flashings: See Section 07 6200.

E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.

B. Removal of existing floor coverings.

C. Patching compound.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2020a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 2020.

C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Specified remediation, if required.
   3. Patching, smoothing, and leveling, as required.
   4. Other preparation specified.
   5. Adhesive bond and compatibility test.
   6. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

F. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

G. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2019.

H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

K. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

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

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire-Resistance-Rated Partitions: See drawing A03.01 for rated assembly source; 1 hour rating.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. National Gypsum Company: www.nationalgypsum.com/#sle.
   5. USG Corporation: www.usg.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required all restrooms, kitchen backsplash, laundry, janior storage, App Bay behind eyewash.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 1/2 inch (13 mm).

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
   2. Application: Horizontal surfaces behind tile in wet areas including countertops.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   5. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.

D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Type X Thickness: 5/8 inch (16 mm).
   5. Edges: Tapered.

2.03 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3.5 inch (89 mm).

B. Acoustical Shielding: Recycled ethylene vinyl acetate (EVA) sheet membrane; applied between studs and gypsum board.
   1. Fire Resistance: Where fire-resistance rating is specified for the wall in which the acoustical shielding membrane is mounted, provide assemblies that have been tested in accordance with ASTM E119 for the same rating as the wall.

C. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.

D. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

E. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. Anchorage to Substrate: 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 that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for wall applications.

B. Ceramic trim.

C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.

C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2016).

D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017.

K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2016).

M. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.

N. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

O. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).

P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2019.

Q. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples:
1. Physical samples of each tiles of specified color in all different matrial, shapes, and trims.
2. Physical samples of all available colors for selection by Architect.
3. Physical samples of non-ceramic trims.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 1 percent of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Natural Stone Institute (NSI) Accredited Commercial B Contractor (light commercial): www.naturalstoneinstitute.org/#sle.

C. Installer Qualifications:
1. Company specializing in performing tile installation, with minimum of five years of documented experience.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
1. Dal-Tile Corporation: www.daltile.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Glazed Wall Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
2. Size: 3 by 6 inch (76 by 152 mm), nominal.
3. Color(s): As indicated on drawings.
4. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.
5. Products:
   a. Dal-Tile Corporation; Color Wheel: www.daltile.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Porcelain Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size: 18 by 18 inch (457 by 457 mm), nominal.
3. Thickness: 3/8 inch (9.5 mm).
4. Surface Finish: Matte.
5. Color(s): As indicated on drawings.

6. Products:
    a. Dal-Tile Corporation; Xteriors: www.daltile.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
    1. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
    1. Applications:
        a. Open edges of wall tile.
        b. Wall corners, outside and inside.
    2. Manufacturers:
        a. Schluter-Systems: www.schluter.com/#sle.
        b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
    1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
    2. Bostik Inc: www.bostik-us.com/#sle.
    3. Custom Building Products: www.custombuildingproducts.com/#sle.
    4. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
    5. LATICRETE International, Inc: www.laticrete.com/#sle.
    6. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
    7. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
    1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
    2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
    3. Color(s): As selected by Architect from manufacturer's full line.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
    1. Applications: Between tile and plumbing fixtures.
    2. Color(s): As selected by Architect from manufacturer's full line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 CLEANING

A. Clean tile and grout surfaces.

3.05 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.06 SCHEDULE

A. Refer to Drawing Sheet A60.01, Finish Legend.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2015).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

D. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

E. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

G. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

H. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance From Various Sources Using Static Environmental Chambers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 2 by 4 inch (50 by 50 mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type RES-1: Solid vinyl with color and pattern throughout thickness.
   1. Manufacturers:
      a. Mohawk Group: www.mohawkgroup.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
   5. Total Thickness: 0.125 inch (3 mm).
   6. Color: As indicated on drawings.

2.02 RESILIENT BASE

A. Resilient Base - Type RES-2: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Armstrong Flooring.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: 4 inch (100 mm).
   3. Thickness: 0.125 inch (3.2 mm).
   4. Finish: Satin.
   5. Color: As indicated on drawings.

2.03 ACCESSORIES

A. Adhesive for Vinyl Flooring:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 SCHEDULE

A. Refer to drawing sheet A60.01, Finish Legend.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Surfaces inside cabinets.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
D. Samples: Submit two paper chip samples, 4 by 4 inch (102 by 102 mm) in size illustrating range of colors available for each surface finishing product scheduled.
E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
B. Paints:
   1. Base Manufacturer: Benjamin Moore: www.benjaminmoore.com/#sle.
   2. PPG Paints: www.ppgpaints.com/#sle.
   3. Rodda Paint Co: www.roddapaint.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

5. Miller Paint: www.millerpaint.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Colors: As indicated on drawings.
   1. Unless otherwise noted, in finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
   1. Two top coats and one coat primer.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:

F. Masonry:

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Galvanized Surfaces:

K. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

L. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.02 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.03 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view, except _____.
   1. Interior Ceilings and Bulkheads: GI-OP-3L, flat.
   2. Interior Walls: eggshell.

B. Shop-Primed Metal Items: Finish surfaces exposed to view, except ____.
   1. Interior: MI-OP-2A.

3.04 COLOR SCHEDULE

A. Refer to drawing sheet A60.01, Finish Legend.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2020.

C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

1.04 SUBMITTALS

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

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 6000 - Product Requirements, for additional provisions.

F. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Inpro: www.inprocorp.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Corner guards fabricated from rolled section or bent plate are specified in Section 05 5000.
   2. Material: High impact vinyl with full height extruded aluminum retainer.
   3. Width of Wings: 3 inches (76 mm).
   4. Corner: Square.
   5. Color: As selected from manufacturer's standard colors.
   6. Length: One piece.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches (102 mm) above finished floor to ____ inches high (____ mm high).

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

1.04 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Georgia-Pacific Professional: www.blue-connect.com/#sle.
   5. Bobrick: www.bobrick.com/#sle.
   6. Substitutions: Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, smooth N.4.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 24" x 36".
   3. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
   5. Products:
      a. Bobrick B-290 Series.
      b. Substitutions: Section 01 6000 - Product Requirements.

B. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
      b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) Bobrick B5806.
         2) Substitutions: Section 01 6000 - Product Requirements.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Towel Bar: Stainless steel, 3/4 inch (20 mm) square tubular bar; rectangular brackets, concealed attachment, satin finish.
   1. Length: 24 inches (610 mm).
   2. Products:
      a. Bradley 9054.
      b. Substitutions: Section 01 6000 - Product Requirements.

B. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Products:
      a. Bradley 9314.
      b. Substitutions: Section 01 6000 - Product Requirements.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 22 4000 - Plumbing Fixtures.

2.07 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.
   2. Hooks: Four, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: Manufacturer's standard length for number of holders/hooks.
   5. Products:

a. Bobrick, B-239.
b. Substitutions: 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.
B. Provide templates and rough-in measurements as required.
C. Provide blocking in wall as required.

3.03 INSTALLATION

A. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Mirrors: 40" inch (1016 mm), measured from floor to bottom of mirrored surface.
   3. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

3.05 SCHEDULE

A. TA-01: Mirror
B. TA-02: Soap Dispenser (OFCI)
C. TA-03: Grab Bars
D. TA-04: Towel Bar
E. TA-05: Toilet Paper Dispenser (OFCI)
F. TA-06: Paper Towel Dispenser (OFCI)
G. TA-07: Robe Hook

END OF SECTION

SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping: Plumbing connections for appliances.

B. Section 26 0583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Refrigerator: Free-standing, side-by-side, refrigerator only, and frost-free.
   1. Capacity: Total minimum storage of 30 cubic ft (0.85 cu m); minimum 25 percent freezer capacity.
   2. Features: Include glass shelves, automatic icemaker, in-door water and ice dispenser, and ADA compliant.
   3. Exterior Finish: Stainless steel.
   4. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

5. Basis of Design: Whirlpool 28.4-cu ft Side-by-Side Refrigerator with Ice Maker; WRS588FIHZ.

B. Range: Electric, free-standing, with glass-ceramic cooktop.
1. Size: 30 inches (762 mm) wide.
2. Oven: Self-cleaning.
3. Elements: Four (4).
4. Controls: Push-to-turn knobs with electronic clock and timer.
5. Features: Include storage drawer, oven door window, oven light, and ADA compliant.
6. Exterior Finish: Stainless steel.
7. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com/#sle.
   b. GE Appliances: www.geappliances.com/#sle.
   c. Whirlpool Corp: www.whirlpool.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
8. Basis of Design: GE Appliances 30" Free-standing Radiant Smooth Cooktop Range; JB480STSS.

C. Microwave: Countertop.
1. Capacity: 1.5 cubic ft (0.042 cu m) minimum.
2. Power: 1000 watts minimum.
3. Features: Include turntable and timer, clock, power level, & sound..
4. Exterior Finish: Stainless steel.
5. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com/#sle.
   b. GE Appliances: www.geappliances.com/#sle.
   c. Whirlpool Corp: www.whirlpool.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

D. Dishwasher: Undercounter.
1. Controls: Solid state electronic.
2. Wash Levels: Three (3).
3. Cycles: Three (3), including auto sense, heavy wash, and light wash.
4. Features: Include rinse aid dispenser, adjustable upper rack, and ADA compliant.
5. Tub & Door Liner: Stainless steel.
6. Finish: Stainless steel.
7. Sound Level: 46 dbs or lower.
8. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com/#sle.
   b. GE Appliances: www.geappliances.com/#sle.
   c. Whirlpool Corp: www.whirlpool.com/#sle.
   d. Bosch: www.bosch-come.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements.
9. Basis of Design: Bosch, 300 Series Dishwasher 24" stainless steel, SGE53B55UC

2.02 LAUNDRY APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Washer & Dryer Set (Matching Design)

C. Clothes Washer: Front-loading.
1. Size: Large capacity, 5 cu.ft or more.
2. Controls: Solid state electronic.
3. Cycles: Include normal, permanent press, delicate, soak, and automatic soak.
4. Motor Speed: Single-speed.
5. Features: Include optional second rinse, bleach dispenser, fabric softener dispenser, self-cleaning lint filter, sound insulation, end of cycle signal, and ADA compliant.

6. Finish: Painted steel, color to be selected from available colors.
7. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com/#sle.
   b. GE Appliances: www.geappliances.com/#sle.
   c. Whirlpool Corp: www.whirlpool.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
8. Basis of Design: GE Washer PFW950SPTDS

D. Clothes Dryer: Electric, stationary.
1. Size: Large capacity.
2. Controls: Solid state electronic, with electronic moisture-sensing dry control.
3. Temperature Selections: Five.
4. Cycles: Include normal, permanent press, knit/delicate, and air only.
5. Features: Include interior light, reversible door, stationary rack, sound insulation, end of cycle signal, and ADA compliant.
6. Finish: Painted steel, color to be selected from available colors.
7. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com/#sle.
   b. GE Appliances: www.geappliances.com/#sle.
   c. Whirlpool Corp: www.whirlpool.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
8. Basis of Design: GE Dryer PFD95SPTDS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

B. Field verify dimensions to confirm proper space is provided for installation of equipment.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework.

B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

D. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.

E. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

H. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
   1. Flat Sheet Thickness: 1-1/4 inch (32 mm), minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Wilsonart: www.wilsonart.com/#sle.
         2) Substitutions: See Section 01 6000 - Product Requirements.
      b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
      c. Sinks: Separate units for undercounter mounting; minimum 3/4 inch (19 mm) wall thickness; comply with IAPMO Z124.
      d. Finish on Exposed Surfaces: Polished.
      e. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch (19 mm), minimum.
   4. Exposed Edge Treatment: Built up to minimum 1 1/2" inch (38 mm) thick; square edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches (102 mm), unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

A. Refer to drawing sheet A60.01, Finish Legend.

END OF SECTION

SECTION 21 00 00

FIRE SUPPRESSION GENERAL CONDITIONS

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 13 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
21 13 16	Dry-Pipe Sprinkler Systems

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over fire protection installation.
1. International Building Code (IBC) with local amendments.
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. **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

F. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate model and all accessories intended for use.

G. Equipment vendor cover page with contact information shall precede submittal by that vendor.

H. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description
   2. Manufacturer and model
   3. Dimensions
   4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
   5. Construction Materials
   6. Ratings (i.e. UL, FM, NEMA, etc)
   7. Electrical data
   8. Vibration Isolation
   9. Controls and wiring diagrams
   10. Accessories
   11. Engineering technical data (i.e. pressure drops, leakage rates, pump curves)

1.5 SHOP DRAWINGS

A. Prepare Shop Drawings stamped and signed by a NICET Class III Certified designer. Develop in accordance with NFPA 13 and the State and Local Fire Marshals. Submit PDF copies of these drawings for approval prior to beginning work.

B. Submit shop drawings to Architect, Local Fire Marshal, and all other approving authorities. Drawings shall be approved by all agencies prior to fabrication or installation. **Drawings submitted for Architect's approval shall have been stamped approved by the Fire Department.**

C. The Contractor shall draw the design team’s attention to any areas in which they contemplate deviations from the conceptual information shown on the contract documents (e.g., due to site conditions).

D. These drawings and diagrams shall show all pipe sizes as well as the manufacturer’s name and catalog number of each piece of equipment used.

E. The Architect's review of such drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, nor shall it relieve him from responsibility for errors or omission in such drawings.

F. Fire Sprinkler shop drawings shall indicate all relevant pipe, ceiling, and structural elevations and clearances. All elbows, offsets, and turns shall be clearly identified. All required access doors shall be shown. By submission of sheet fire sprinkler shop drawings, the Contractor acknowledges that coordination has been done to ensure that all ductwork and piping fits and no conflicts exist.

G. Indicate layout of piping and sprinkler locations coordinated with ceiling type, lighting, structural and mechanical. Conform to symmetrical spacing of heads and integrate into locations of lights and other ceiling devices. Center heads on ceiling tiles (+/- 1") and align in straight rows.

H. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories. Include building sections and a plot plan showing location of underground supply connections, outside control valves, fire department connections and other equipment to be used.

I. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation layout, mounting and support details, and piping connections.

J. Indicate layout of flexible connectors, expansion joints, expansion compensators, loops, offsets and swing joints.

K. Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.

L. Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation.

M. Indicate system controls.

1.6 FIRE SPRINKLER PERMIT

A. Fire Sprinkler contractor shall prepare all documents for permit application, submit and obtain the permit from reviewing authority. All costs and fees to obtain the permit shall be paid by the Fire Sprinkler Contractor.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 13 and Local and/ or State Fire Marshal.

B. Perform work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

C. CPVC fire sprinkler piping located in plenums: Peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet when tested in accordance with UL 1887.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of continuous representation, a stocking distributor and service representative in the State of Washington.

B. Contractor: Licensed and regularly engaged in the specialized design and installation of automatic sprinkler equipment as listed by UL or other nationally recognized testing laboratories. Minimum three years' experience and have installed at least five systems of comparable size.

C. Bids by wholesalers, suppliers or any firm whose principal business is not that of manufacturing and/or installing fire protection systems are not acceptable.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Furnish cast iron and steel valves with temporary protective coating with end caps and closures on piping and fittings. Maintain in place until installation.

C. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

1.10 FIELD MEASUREMENTS

A. Where the word 'verify' is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

B. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

1.11 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Mechanical drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.

D. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

E. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

F. Prior to ordering equipment cross-check mechanical and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

G. Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

H. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

I. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device of fixture roughed in improperly and not positioned on implied centerlines or as required by good practice must be repositioned at no cost to the Owner.

1.12 CUTTING, FITTING, REPAIRING AND PATCHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

1.13 SALVAGE

A. Remove excess piping and plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.

B. Comply with contractor’s Construction Waste Management Plan

1.14 EXTRA MATERIALS

A. Provide extra sprinklers under provisions of NFPA 13.

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

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

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. 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.

B. 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.

C. Steel Pipe: ASTM A53 Grade B, ASTM A135, ASTM A795 Schedule 40 galvanized. Use only for dry-pipe sprinkler system and dry standpipes.
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: Malleable galvanized housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers. ASTM A449. Victaulic, Gruvlok or approved equal.
   a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-

13, fully installed at visual pad-to-pad offset contact. (Couplings that require exact gapping at specific torque ratings are not permitted.). Basis of Design: Victaulic Style 009N and 107N.

b. Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Style 177 or Style 77.

6. Installation-Ready™ fittings for Schedule 40 grooved end steel piping in fire protection applications sizes 1-¼ thru 2½ inches. Ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, pre-lubricated Grade “E” EPDM Type ‘A’ gasket, and ASTM A449 electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi and FM approved for working pressure 365 psi.

D. Steel Pipe: ASTM A135 Grade A, UL threadable thin wall, black.
1. Cast Iron Fittings: ASME B16.4, threaded fittings.
2. Malleable Iron Fittings: ASME B16.3 threaded type.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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 – 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.

3.4 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.

3.5 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.

3.6 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.

3.7 MANUFACTURER'S FIELD SERVICES

A. Furnish inspection services by flexible pipe manufacturer's representative for final installation and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

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 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. Fire suppression system shall not contain ozone depleting substances such as halons, CFC's and HCFC's.

PART 2 PRODUCTS

2.1 SPRINKLERS

A. Manufacturers: Tyco, Reliable, Viking or approved equal.

B. Provide "quick response" heads in all residential occupancies.

C. Provide "quick response" heads in all light hazard occupancies.

D. Suspended T-bar Ceiling Type:
1. Type: Semi-recessed pendant type with matching escutcheon plate.
2. Sprinkler and escutcheon plate finish: Chrome plated enamel factory finish.
3. Fusible link: Glass bulb type temperature rated for specific area hazard.

E. GWB Ceiling Type:
1. Type: Semi-recessed pendant type with matching escutcheon plate.
2. Sprinkler and escutcheon plate finish: Chrome plated factory finish.
3. Fusible link: Glass bulb type temperature rated for specific area hazard.

F. Exposed Area Type:
1. Type: Standard upright type.
2. Finish: Brass
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

G. Side wall Type:
1. Type: Semi-recessed 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.

H. Guards: Finish matching sprinkler finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 13.

B. Install pressure gauges on each side of sprinkler alarm valve.

C. Place pipe runs to minimize obstruction to other work.

D. 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.

E. Install main piping in concealed spaces above finished ceilings or soffits; branch piping in joist space or other concealed space to sprinkler heads.

F. Center sprinklers in two directions in ceiling tile and install piping offsets.

G. Install guards on sprinklers exposed to potential damage.

H. Provide drains at system low points.

I. Hydrostatically test entire system.

J. Testing must be witnessed by Authorities having jurisdiction.

3.2 CLEANING

A. Flush entire piping system of foreign matter.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

END OF SECTION

SECTION 21 13 16

DRY-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes dry-pipe sprinkler system design, installation, and certification.

1.2 SYSTEM DESCRIPTION

A. Determine volume and pressure of incoming water supply from water flow test data. Revise design when test data become available prior to submittals.

B. Interface system with building fire and smoke alarm system.

C. Provide fire department connections. Note if location(s) are indicated on Drawings.

D. Fire suppression system shall not contain ozone depleting substances such as halons, CFC's and HCFC's.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 13 local municipality having jurisdiction.

PART 2 PRODUCTS

2.1 SPRINKLERS

A. Manufacturers: Tyco, Reliable, Viking or approved equal.

B. Suspended T-bar Ceiling Type:
1. Type: Semi-recessed pendant type with matching escutcheon plate.
2. Sprinkler and escutcheon plate finish: Chrome plated factory finish.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. GWB Ceiling Type:
1. Type: Semi-recessed pendant type with matching escutcheon plate.
2. Sprinkler and escutcheon plate finish: Chrome plated factory finish.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Exposed Area Type:
1. Type: Standard upright type.
2. Finish: Brass
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Side wall Type:
1. Type: Semi-recessed horizontal side wall 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.

F. Guards: Finish matching sprinkler finish.

2.2 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, bronze main seat and mechanism to automatically actuate electric alarm with test and drain. Pressure gauges each side of valve. Viking or approved equal.

B. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

C. Pressure Switch: Two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 13.

B. Install piping to minimize obstruction with other work.

C. 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.

D. Install main piping in concealed spaces above finished ceilings or soffits; branch piping in joist space or other concealed space to sprinkler heads.

E. Center sprinklers in two directions in ceiling tile and install piping offsets.

F. Install guards on sprinklers exposed to potential damage.

G. Install air compressor on vibration isolators.

H. Provide drains at system low points.

I. Hydrostatically test entire system.

J. Test must be witnessed by Authority having jurisdiction.

3.2 CLEANING

A. Flush entire piping system of foreign matter.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

END OF SECTION

SECTION 22 00 00

PLUMBING GENERAL CONDITIONS

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 26 00 Liquid-Petroleum 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.

1.5 PRODUCT SUBSTITUTIONS:

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed must be submitted for approval.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and must guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, "or approved" may be assumed for all products in Division 22.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 22 and all additional products noted on drawings or required for completion of sequence of operations.

B. **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description
   2. Manufacturer and model
   3. Dimensions
   4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
   5. Construction Materials
   6. Ratings (i.e. UL, ASTM, NEMA, etc)
   7. Electrical data
   8. Sound level data (corresponding to scheduled values)
   9. Vibration Isolation

10. Controls and wiring diagrams
11. Accessories
12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves)

F. If requested by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

G. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

1.7 SHOP DRAWINGS

A. 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 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. 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 materials and finishes during handling and installation to prevent damage.

F. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

G. 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. Power Wiring: By Electrical Contractor.

C. 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 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout.
1. Execution of Architect's and Engineer’s final observation reports (punchlist)
2. Operating and Maintenance Instructions
3. Operating and Maintenance Manual
4. Equipment and Pipe Cleaning
5. Record Drawings
6. Testing
7. Commissioning
8. Warranty

B. See Division 01 for additional requirements.

1.21 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of plumbing systems and prior to acceptance by the Architect, perform the following services.

B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   1. Provide documentation of all instruction which includes:
      a. Date and time of instruction
      b. Name, affiliation and qualifications of the instructor
      c. Name and affiliation of the attendees
      d. Topics, systems, and equipment covered
      e. Length of instruction

F. Minimum duration of instruction periods:
   1. Plumbing Systems 2 hours

1.22 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
   2. Warranty service contractors' names, address and phone numbers (if different from above).
   3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
   4. Test data log.
   5. Manufacturer's cuts and rating tables, including brochures for all submittal items.
   6. Part numbers of all replaceable items.
   7. Control diagrams and operation sequence.
   8. Written guarantees.
   9. Record drawings corrected and completed.
   10. Completed equipment start-up forms and checklists.

B. Operation and Maintenance Data:
   1. Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.
   2. Submit fixture, trim, exploded view and replacement parts lists.
   3. Submit replacement part numbers and availability, and nearest service depot location and telephone number.

C. Binders:
   1. Furnish typewritten or printed index and tabbed dividers between principal categories.
   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.

1.23 EQUIPMENT AND PIPE CLEANING

A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe and equipment. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary again before owner occupancy.

C. Clean exterior of all exposed pipe and equipment.

1.24 RECORD DRAWINGS

A. Submit one digital file with all drawings in PDF format.

B. Show location of equipment, location and size of piping. Locate all valves and similar equipment with tag or label identification. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.

C. Record actual locations of equipment, clean-outs, controlling devices, and all above grade, under-floor, and buried piping.

1.25 TESTING

A. Provide completed start-up forms and checklists.

B. Coordinate Test and Balance with Division 23 05 93. Provide all necessary assistance and documentation.

1.26 WARRANTIES AND CONTRACTOR'S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.

C. Without cost to Owner, **correct all defects and failures discovered within one year from date of final acceptance**, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees that exceed one year (e.g.: water heaters).

E. Make all necessary balancing and control adjustments during first year of operation.

F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.

3.2 INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

3.3 FIELD QUALITY CONTROL

A. Inspect installed fire stopping for compliance with specifications and submitted schedule.

B. Inspect isolated equipment after installation for proper movement clearance.

C. Test domestic water piping system in accordance with applicable code and local authority having jurisdiction.

D. Test sanitary waste and vent piping system in accordance with applicable code and local authority having jurisdiction.

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 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

B. Do not permit use of plumbing fixtures before final acceptance.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. General Plumbing Valves.
2. Hangers and Supports.
3. Firestopping.
4. Access Panels
5. Tags and Identification.
6. Execution

1.2 GENERAL REQUIREMENTS

A. Comply with requirements and recommendations of Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58 and SP-69.

B. Comply with Federal "Reduction of Lead in Drinking Water Act" – 2011. Pipes, pipe fittings, plumbing fittings and fixtures shall be "Lead Free" meaning not more than a weighted average of 0.25% lead in wetted surfaces.

1.3 SCOPE

A. This section includes products, assemblies and methods applicable to more than one of the systems specified in the following sections of Division 22.

1.4 MATERIALS AND EQUIPMENT

A. Where two or more units of same class of equipment are required, use products of a single manufacturer. All equipment shall be new and free from damage.

B. Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

C. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

1.5 QUALITY ASSURANCE

A. Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.

PART 2 PRODUCTS

2.1 GENERAL VALVE REQUIREMENTS

A. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted. Brass valves are not permitted.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.2 GATE VALVES

A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.

B. 4 inches and Smaller: Use ball valve or butterfly valve in lieu of gate valve.

2.3 BALL VALVES

A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.

B. 2 inches and Smaller: Lead-Free, NSF-61-8, UPC-IGC-157, MSS SP 110, 600 psi WOG, two piece silicon performance bronze body, bronze trim, bronze ball, full port, PTFE seats, blow-out proof stem, solder or threaded ends with union, lever handle. For insulated piping provide 2" extended handles of non-thermal conductive material. Nibco Model T/S-585-80-LF.

2.4 CHECK VALVES

A. Swing Check Valves:
1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
2. 2 inches and Smaller: Lead-Free, NSF-61-8, MSS SP 80, 200 psi CWP, silicone performance bronze body and cap, bronze disc with PTFE seat, Y-pattern design, solder or threaded ends. Nibco Model T/S-413-Y-LF.
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.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 220700.
   1. Manufacturer: Pipe Shields, INC or approved equal.
   2. Material: Calcium Silicate or Uretherne per temperature application.
   3. Thickness: Insert thickness shall match required insulation thickness per 220700.

B. Plumbing Piping - DWV: Cast-iron or PVC
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   5. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   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. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   10. Copper Pipe Support: Copper-plated, Carbon-steel ring.

D. Steel Piping: LPG
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   3. Vertical Support: Steel riser clamp.
   4. 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.

2.6 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.7 INSERTS

A. Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.8 ACCESS PANELS

A. Milcor or approved equal.

B. Include an allowance for a minimum of 16 access panels.

C. Architectural grade, 16 guage frame and door, painted steel or stainless steel based on application.

D. Provide with optional cylinder lock, common key for all panels.

2.9 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
1. Ferrous Piping: Class 150, 300 psi CWP, malleable iron, threaded.
2. Copper Piping: Class 150, 300 psi CWP, bronze unions.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
4. PVC Piping: PVC.
5. CPVC Piping: CPVC.

B. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or Schedule 80 threaded PVC pipe (ASTM D2464).

2.10 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal 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.

2.11 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sealant: Acrylic

D. Size large enough to allow for movement due to expansion and to provide for continuous insulation or installation of fire sealant at fire-rated walls. Note that insulation is discontinuous at fire walls.

2.12 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 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.

2.14 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.

2.15 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.

2.16 VIBRATION ISOLATORS

A. Manufacturers: Mason, Amber Booth or approved equal.

B. 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.

2.17 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.

2.18 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**
Compressed Air	**Blue**	**White**	**COMPRESSED AIR {xxx} PSI**
Propane	**Yellow**	**Black**	**PROPANE GAS**

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.

2.19 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color-coded head.

B. Color code plumbing valves green.

2.20 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. Adjust equipment level.

3.16 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.

3.17 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by firestoppping material installation.

3.18 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

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

SECTION 22 07 00

PLUMBING INSULATION

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 flanges and unions with removable sections and jackets.

E. Piping Inserts and Shields:
1. Insulation shall be continuous through supports and hangers with incompressible inserts and shields. Do not directly clamp/support pipe scheduled to be insulated.
2. Shields: Galvanized steel saddle between pipe clevis hangers or pipe rollers and insulation. Minimum 6 inches long, of contour matching adjoining insulation; may be factory fabricated.
3. Inserts: Between pipe clamps, hangers or rollers and piping.
4. Insert material: Compression resistant insulating material suitable for insulation type and planned temperature range and service.
5. Glue insulation to both sides of insert.
6. Shields without inserts may be used at clevis hangers on refrigerant piping 5/8” and smaller with continuous insulation.

F. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Exposed Equipment: Locate insulation and cover seams in least visible locations.

I. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands

J. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

K. Finish insulation at supports, protrusions, and interruptions.

L. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

M. 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	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"
Tempered Hot Water	Glass Fiber RIGID	1"	1"	1-1/2"	1-1/2"
Domestic water H/C/R/T outside conditioned space	Glass Fiber RIGID	1-1/2”	1-1/2”	2”	2”
Condensate Drains	RIGID / FOAM	1/2"	1/2"	1/2"	1/2"

1. Do not insulate direct burial cold water.
2. For all exterior piping applications use only Elastomeric Cellular Foam with Aluminum jacket.

B. Equipment: Provide on equipment as listed below.

Service	**Insulation Type**	**Thickness**	**Jacket**
Expansion Tank	Glass Fiber BLANKET	2”	Reinforced White-Kraft Paper

END OF SECTION

SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Domestic water piping.
2. Piping Accessories.
3. Circuit Balancing Vavle
4. Water pressure reducing valves.
5. Reduce pressure backflow assembly.
6. Thermostatic mixing valves.
7. Pressure balanced mixing valves.

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™.

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 AUTOMATIC FLOW BALANCING VALVE

A. Manufacturers: Caleffi 127, Nibco Flo-Boss or approved equal.

B. Construction: Low-lead brass body, anti-scale polymer flow cartridge, stainless steel spring, EPDM seals. 200 psi max working pressure. 200 F max temperature.

C. Control: Working pressure ranges 2-14 psid or 2-32 psid for flows from 0.5 gpm to 5 gpm.

2.8 WATER PRESSURE REDUCING VALVES

A. Manufacturers: Watts or equal by Apollo/Conbraco, Wilkens, Victaulic or approved equal.

B. 2 inches and Smaller: Lead-Free cast copper silicon body with stainless steel inlet strainer, reinforced EPDM diaphragm, replaceable stainless steel seat, adjustable outlet pressure between 25-75 psi, 300 psi working pressure, 33F-160F operating temperature range. Watts LFU5B.

2.9 STRAINERS

A. Manufacturers: Apollo/Conbraco, Metraflex, Titan, Nibco or approved equal.

B. 4 inch and Smaller: Threaded or Solder, 400 PSI CWP, lead-free bronze body, Y-pattern with 20 mesh stainless steel perforated screen. Apollo 59LF.

2.10 REDUCED PRESSURE BACKFLOW PREVENTERS (RPBA)

A. Manufacturers: Watts or equal by Apollo/Conbraco, Wilkens or approved equal. Must be listed as acceptable by the State of Washington Cross Connection Manual.

B. 2 inches and Smaller: Lead-Free. Comply with ASSE 1013. Cast copper silicone body with internal pressure differential relief valve located between two positive seating captured spring check valves, inlet Y-strainer, inlet and outlet shutoff ball valves, ball valve test cocks, replaceable polymer seats and silicone seat discs, air gap drain fitting, 175 psi working pressure, 33-180 F operating temperature range. Watts model LF919.

2.11 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.

2.12 THERMOSTATIC MIXING VALVE (ELECTRONIC)

A. Manufacturers: Heat-Timer ETV Platinum Plus, equal by Leonard or approved equal.

B. The control shall operate on 120VAC. The control shall be pre-engineered and programmed for the direct valve actuator operation in a domestic hot water heating system. It shall incorporate the following components:

C. Control: A microprocessor Electronic Tempering Valve control with PID-type logic, built-in transformer, digital display of temperature and set point, and LED indicator. It shall be capable of controlling a set point range from 40°F to 200°F. It shall display the valve opening percentage to match actuator percent. The control shall maintain set point temperature within ±2°during a domestic draw of 0.5 gpm to full flow capacity in accordance with ASSE 1017.

D. Actuator: An actuator/Motor and linkage capable of traveling the complete valve stroke from fully OPEN to fully CLOSE in less than 20 seconds. It shall calibrate to the actual valve stroke. The actuator is also capable of operating in the reverse direction, allowing the interchangeability of the HOT and COLD connections to the valve body.

E. Stainless Steel Valve: An NPT threaded 3-way mixing valve with 304 stainless steel body and trim. The maximum operating temperature of the valve shall be 300°F (149°C) with a maximum working pressure of 225 psi.

F. Sensor: Temperature sensor of the thermistor type that can measure from -30°F to 250°F.

G. Features:
1. The control shall modulate the mixing valve to match the set point.
2. Setpoint: The control shall offer the user the ability to adjust the setpoint using a menu option and it shall display the setpoint at all times on the default screen.
3. Modes of Operation: The control shall operate as an electronic tempering valve with high temp alarm/safeguard.
4. Schedules: The control shall offer the user the ability to set a schedule where the control overrides the setpoint and sets an absolute water temperature. The

control shall offer schedules for each day, every day, weekdays only, and weekends only. Up to four periods can be configured per day.

5. Flow Switch: The control shall offer an input that can accept a dry-contact flow switch to detect when no water flow is detected.
6. Auto Calibration: After initial startup calibration, the actuator/motor shall automatically calibrate itself to the valve attached.
7. Multiple Actuator Connection: The control shall be capable of operating multiple valves piped in parallel with a single 0–10Vdc output signal.
8. Display: The control shall have an alphanumeric display. All control operation information shall be available for display.
9. Memory and Backup: The control shall store all configuration and settings on EEPROM. In case of power failure, the control shall be able to retrieve all of its latest settings when power is restored.
10. Sensor Inputs: The control shall be capable of supporting three standard sensor inputs. The sensor inputs shall be of the thermistor type. Thermistor operating temperature range shall be -30°F to 250°F. Should the sensor show a fault condition, the control shall automatically close the hot port of the valve until the situation is rectified. The sensors shall monitor inlet CW, HW and outlet mixed water temperatures. Locate the CW and HW inlet sensors at least 6 feet from the valve. The CW sensor shall also be downstream of the HWC connection. Locate the mixing outlet sensor between 1 and 3 feet from the valve.
11. Alarm / Safeguard Option: The control shall have a manual reset button that will exit the control from its alarm status. The reset function shall only work when the temperature has dropped below the alarm setpoint. The control will turn on an alarm indicator and energize both alarm relays for optional external alarms. When the alarm is corrected the control is reset.
12. Power Failure: The control shall automatically shut off the flow of hot water in the event of a power failure.

2.13 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.

2.14 TEMPERING VALVE (PUBLIC LAV)

A. Manufacturers: Symmons, Leonard, Powers, Acorn or approved equal.

B. General: Lead-Free brass and bronze body with brass and stainless steel flow control components with check stops, vandal resistant lockable handle, rough [bronze] [chrome] finish. Certified to ASSE 1070 standard.

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 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 plastic ribbon tape continuous over top of pipe.

J. 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 - 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.

3.5 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.

3.6 INSTALLATION - THERMOMETERS AND GAUGES

A. Install pressure gauges on each side of domestic water service assembly (i.e double check, PRV, etc.).

B. Install gauge taps in piping.

C. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.

D. 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.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.7 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.

3.8 FIELD QUALITY CONTROL

A. Test domestic water piping system at 100 psig minimum for a period of not less than 4 hours.

3.9 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

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

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. Floor sinks.
6. Cleanouts.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe & Fittings: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
1. Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
2. Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international. Minimum 4 clamps up to 4”, 6 clamps for 5” and larger. Husky SD (Super-Duty) 4000, Clamp-All 125, Ideal Tridon Super Heavy-Duty or approved equal.

B. ABS Pipe: Schedule 40, ABS material, DWV, Cellular Core, bell and spigot style solvent sealed ends. NSF Standard 14, ASTM F628, ASTM D3965.
1. Fittings: ABS, DWV, ASTM D2661.
2. 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 or approved equal.
3. Joints: Standard-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly. ASTM C-564 Neoprene gasket. CISPI

310 and certified by NSF international. Husky HD 2000, Clamp-All 80, Mission Heavyweight, Ideal Tridon Heavy-Duty “HD” Yellow 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.

2.6 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 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 elevations of buried piping with not less than 3 ft of cover.

G. Establish minimum separation from other services piping in accordance with Code.

H. Provide piping layout to satisfy the UPC requirements for suds relief.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install plastic ribbon tape continuous over top of pipe.

L. Install trace wire continuous over top of pipe.

3.5 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient at 1/4” per foot where possible, but in no case less than 1/8” per foot. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Install piping on interior side of building insulation.

E. Provide heat tape for all p-traps in unheated areas.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access panel where valves and fittings are not accessible.

K. Install non-conducting dielectric connections wherever jointing dissimilar metals.

L. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Provide 1/8 inch per foot only where necessary and allowed by local jurisdiction. Maintain gradients.

M. Provide piping layout to satisfy the UPC requirements for suds relief.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

O. Install piping penetrating roofed areas to maintain integrity of roof assembly.

P. Insulate piping. Refer to Section 22 07 00.

Q. Install pipe identification in accordance with Section 22 05 00.

3.6 INSTALLATION - SANITARY WASTE AND VENT SYSTEMS

A. Install sanitary waste and vent piping systems in accordance with ASME B31.9 and local plumbing code.

B. Support cast iron drainage piping at every joint.

C. Flash and counterflash. Install vents passing through roof with roof flashing and counterflashing assemblies. 3lb. lead soldered joints and seams, 24 x 24 base pad and counterflashed into pipe.

D. Install automatic trap primers throughout at floor drains except those located in showers. Provide access panel for trap primers.

E. Provide piping layout to satisfy the UPC requirements for suds relief.

F. Provide cleanouts every 50 feet and install at all locations required by code and to permit cleaning of all waste piping. Provide cleanouts full size of pipe, but no larger than 4”. Coordinate with Architect when cleanouts are located in finished rooms. Install cleanout threads with graphite. Locate cleanouts to clear cabinet work and to be easily accessible.

3.7 FIELD QUALITY CONTROL

A. Obtain written approval of local Plumbing Authority prior to covering or concealing any work.
B. Test sanitary waste and vent piping system to hydrostatic test of 10 feet head of water.

END OF SECTION

SECTION 22 26 00

LIQUID PETROLEUM GAS SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. LPG piping above grade.
2. Valves & Strainers.

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 DEFINITIONS

A. Where designation LPG is used, it is abbreviation for Liquefied Petroleum Gas, most commonly Propane.

1.4 QUALITY ASSURANCE

A. Perform LPG Work in accordance with NFPA 58.

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.

PART 2 PRODUCTS

2.1 LPG 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.

B. Steel Pipe: ASTM A53, Schedule 40 black, seamless. Manufactured in the USA.
1. Fittings: Viega MegaPress G, 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: 2 inch and smaller pipe - Viega MegaPress G Ridgid tool press.

2.2 BALL VALVES

A. Manufacturers: Nibco, Stockham, Milwaukee, or approved equal.

B. 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)

C. 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)

2.3 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.

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 of pipe, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install LPG piping in accordance with NFPA 58.

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 including underground piping.

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.

3.3 FIELD QUALITY CONTROL

A. Pressure test LPG piping in accordance with NFPA 58.

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

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Water heaters.
2. Diaphragm-type expansion tanks.
3. In-line circulator pumps.
4. Water heater venting (Plastic)

1.2 SCOPE

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 RESIDENTIAL GAS FIRED WATER HEATERS

A. Manufacturers: A.O. Smith GVR, Bradford White, RUUD, or approved equal.

B. Type: Automatic, propane-fired, vertical storage.

C. Tank: Glass lined welded steel with single flue passage, flue baffle and draft hood; minimum 2" R-16 thermal insulation, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs. Minimum energy factor 0.62, minimum 6-year warranty.

D. Controls: Automatic water thermostat and built-in gas pressure regulator; temperature range adjustable from 120 to 170 degrees F, cast iron or sheet metal low NOx burner with silicon nitride igniter, safety pilot and thermocouple. Closed combustion, direct-vent.

E. Accessories: Brass water connections and dip tube, drain valve, aluminum/stainless steel or magnesium anode, and ASME temperature and pressure relief valve.

2.2 DIAPHRAGM-TYPE EXPANSION TANKS

A. Manufacturers: Amtrol, Armstrong or approved equal.

B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; with pre-charged flexible EPDM diaphragm sealed into tank; steel ring base (vertical) or saddles (horizontal)

C. Accessories: Pressure gage and air-charging fitting, tank drain.

D. Installation: Before installation, charge tank with Nitrogen gas to equal domestic water line pressure at tank. Permanently mark fill pressure on tank.

2.3 IN-LINE CIRCULATOR PUMPS

A. Manufacturers: Armstrong ARMflo E Series or similar by B&G, Taco or approved equal.

B. Type: Horizontal shaft, single stage, direct connected, with dry motor for in-line mounting, for 150 psig maximum working pressure.

C. Casing: Cast iron, (all bronze for domestic water), with flanged pump connections.

D. Impeller: 30% glass-filled noryl.

E. Bearings: Sealed, permanently lubricated stainless steel.

F. Shaft: Stainless steel.

G. Seal: Silicon carbide enviroseal with viton eleastomer. 230 degrees F maximum continuous operating temperature.

H. Drive: Two pole, single phase.

I. Accessories:
1. 24 hour timer control.
2. Temperature sensor.
3. P/T test plugs

2.4 FLUE AND COMBUSTION AIR PIPING

A. PVC Pipe: ASTM D1785, Schedule 40 solid wall, polyvinyl chloride (PVC) material.
1. Fittings: ASTM D2665, Schedule 40, PVC.
2. Joints: Solvent weld with ASTM D2564 solvent cement. Prime joints with a contrasting color.

B. CPVC Pipe: ASTM F441/F441M, Schedule 40 solid wall, chlorinated polyvinyl chloride (CPVC) material.
1. Fittings: ASTM F438, CPVC, Schedule 40, socket type.
2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement. Prime joints with a contrasting color.

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.

3.2 INSTALLATION – PROPANE FUEL FIRED

A. Connect propane piping to water heater in accordance with NFPA 58, full size of water heater gas train inlet. Arrange piping with clearances for burner removal and service.

B. Install the following piping accessories on propane piping connections. Refer to Section 22 26 00.
   1. Strainer.
   2. Shutoff valve.

C. Connect flue to water heater outlet, full size of outlet.

3.3 INSTALLATION - FLUE AND COMBUSTION AIR PIPING

A. Install flue and vent piping per manufacturer’s installation instructions. Note maximum allowable venting length.

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. Sleeve pipe passing through partitions, walls and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. 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.

G. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

H. Provide factory vent and combustion air terminations. Flash and seal piping penetrating building exterior to maintain integrity of assembly.

I. Install pipe identification in accordance with Section 22 05 00.

3.4 INSTALLATION - PUMPS

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.

C. Provide line sized shut-off valve and strainer on pump suction, and line sized check valve, balancing valve, and shut-off valve on pump discharge.

D. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump, so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.

E. Provide P/T test plugs.

F. Provide air cock and drain connection on horizontal pump casings.

G. Provide drains for bases and seals.

H. Where appropriate, lubricate pumps before start-up.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. General Plumbing Fixtures: Water closets, Lavatories, Sinks, Service sinks, Showers.
2. Faucets and valves
3. Emergency Fixtures: Emergency Eye and Face Wash.
4. Hose bibbs.
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.	Water closets	1.6 GPF
2.	Shower heads	2.5 GPM
3.	Lavatory faucets (Public)	0.5 GPM
4.	Kitchen faucets	1.75 GPM
5.	Service faucets	2.0 GPM

PART 2 PRODUCTS

2.1 TANK TYPE WATER CLOSETS

A. Manufacturers: Toto or approved equal

B. Gravity: white, vitreous china, floor mount, 12" rough-in, 15" rim height, gravity feed flush with 3" valve, elongated bowl, close-coupled closet combination, insulated vitreous china closet tank with fittings and lever flushing valve, siphon jet, 2-1/8" passageway, chrome plated bolt caps.

C. Gravity (ADA): white, vitreous china, floor mount, 12" rough-in, 16-1/2" rim height, ADA compliant, gravity feed flush with 3" valve, elongated bowl, close-coupled closet combination, insulated vitreous china closet tank with fittings and lever flushing valve, siphon jet, 2-1/8" passageway, chrome plated bolt caps.

2.2 WATER CLOSET SEATS

A. Manufacturers: Bemis, Olsonite or approved equal.

B. Open Front: Heavy duty solid plastic, white, large molded-in bumpers, external check hinges with stainless steel posts, without cover.

C. Closed Front: Heavy duty solid plastic, white, large molded-in bumpers, external check hinges with stainless steel posts, with cover.

2.3 LAVATORIES

A. Manufacturers: Kohler, Eljer, American Standard or approved equal.

B. Wall Hung: white, vitreous china, wall mounted, drilled for concealed arm carrier, overflow, ADA compliant. Provide with wall carrier.

2.4 SINKS

A. Manufacturers: Elkay, Just, Acorn or approved equal.

B. Single Compartment: Seamless 18 gauge. Type 304 stainless steel, self-rimming, radius corners, sound deadening undercoat.

2.5 SERVICE SINKS

A. Manufacturers: Fiat, Florestone, Kohler or approved equal.

B. Floor: Molded stone, 10” deep, stainless steel drain body with strainer and lint basket, vinyl bumperguards, stainless steel wall guards, mop hanger, hose clamp hanger, 5 feet of hose.

C. Wall (laundry tub): Single compartment plastic polymer or molded stone tub with 20 gallon capacity, support legs and wall mounting bracket for mounting to floor and wall.

2.6 SHOWER ENCLOSURES

A. Manufacturers: Fiberfab, Aquatic, Florestone or approved equal.

B. One piece gel-coated fiberglass or acrylic shower stall with stainless steel curtain rod. Curtain rod shall be minimum 6’-3” AFF (verify with architect).

C. (ADA): One piece gel-coated fiberglass or acrylic shower stall, barrier-free with stainless steel curtain rod, folding transfer seat, stainless grab bar.

D. Models that include a flange at the floor threshold shall be installed to conceal the flange. See part 3 for coordination and installation requirements.

2.7 FAUCET, LAVATORY

A. Manufacturers: Chicago, Geberit, Delta HDF, Symmons or approved equal and as specifically noted below.

B. Centerset:
1. Single Handle: Polished chrome plated cast brass, deck mount, metal lever handle, ceramic mixing cartridge, temperature limit stop, 2.2 gpm aerator. Spout length, drain and hole spacing as scheduled.
2. Dual Handle: Polished chrome plated cast brass, deck mount, metal indexed wristblade handles. Spout length, drain and hole spacing as scheduled.
3. Sensor: Polished chrome plated cast brass, deck mount,vandal resistant aerator, DC power, adjustable distance and time delay settings. Spout length, drain and hole spacing as scheduled. Provide 120V power transformer. Chicago, Geberit or Speakman.
4. Metered: Polished chrome plated brass, deck mount, vandal resistant aerator, blade handle, temperature limit stop, time limit stop, slow-closing valve. Spout length, drain and hole spacing as scheduled.

2.8 FAUCET, SINK

A. Manufacturers: Chicago, Delta HDF, Symmons or approved equal.

B. Swing Spout:
1. Single Handle: Polished chrome plated cast brass, deck mount, metal lever handle, ceramic mixing cartridge, temperature limit stop. Spout length, drain and hole spacing as scheduled.

C. Gooseneck:
1. Dual Handle: Polished chrome plated cast brass, deck mount, metal indexed wristblade handles. Spout height, reach, drain and hole spacing as scheduled.

2.9 FAUCET, SERVICE

A. Manufacturers: T&S Brass, Chicago, Delta HDF, Symmons, or approved equal.

B. Wall Mount: Chrome plated brass, vacuum breaker spout with pail hook and wall brace, indexed level handles, hose thread outlet, adjustable supply arms, integral stops and supply check valves.

2.10 SHOWER VALVES

A. Manufacturers: Chicago, Delta HDF, Symmons or approved equal and as specifically noted below.

B. Shower: Pressure balancing valve that cycles from cold to hot, lever handle, chrome plated brass, intergral service stops, complete with shower head, arm and flange.

2.11 SHOWER HEADS

A. Manufacturers: Speakman or approved equal.

B. Solid brass construction, polished chrome finish, 6-jet showerhead, infinitely adjustable spray streams with operating handle, pressure-compensating auto-flow limit to 2.0 gpm.

2.12 SHOWER HAND SPRAY

A. Manufacturers: Alsons or approved equal.

B. Personal hand held shower with push button, on-off control, 60” double spiral metal hose, 24” stainless steel slide/grab bar, ADA adjustable slide, chrome plated vacuum breaker, chrome plated wall supply elbow.

2.13 INSTANTANEOUS HOT WATER DISPENSER

A. Manufacturers: In-Sink-Erator or approved equal.

B. 1/2 gallon insulated tank, 1.75 gal/hour capacity @ 190 F, 140-200 F adjustable thermostat, instant self-closing valve, chrome, UL listed.

2.14 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”.

2.15 RECESSED VALVE BOX

A. Manufacturers: Guy Gray, Acorn, Oatey, Sioux Chief or approved equal.

B. General: Box construction shall match fire rating of wall.

C. Washing Machine: 2” drain socket, 3/4” hot & cold brass valves, wall brackets, face plate.

D. Water: 1/4 turn brass ball valve with recessed wall box, wall brackets, face plate.

2.16 FIXTURE SUPPLIES

A. Manufacturers: Brass Craft, McGuire 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”.

2.17 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.

2.18 LAVATORY INSULATION KIT

A. Manufacturers: Truebro, Plumberex, McGuire or approved equal.

B. Where lavatories or sinks have exposed traps or supplies furnish the following for ADA compliance: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece,

P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers, antimicrobial, with flush reusable fasteners.

2.19 CARRIERS

A. Manufacturers: Wade, J.R. Smith, Zurn, Josam or approved equal.

B. Water Closet: Adjustable, coated cast iron assembly with neoprene closet gasket, integral drain hub and vent, lugs for floor and wall attachment, suitable for type of closet and connecting pipe.

C. Urinal: Adjustable, coated cast iron assembly with neoprene closet gasket, tubular legs, lugs for floor and wall attachment, suitable for type of closet and connecting pipe.

D. Lavatory: Provide concealed arm carriers for all wall mounted lavatories. Coated steel uprights with welded feet, cast iron adjustable headers, concealed arms, lugs for floor and wall attachment, steel sleaves, alignment truss.

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.

D. Verify finish floor elevation and flooring material for shower stall installation.

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.

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. Locate shower head mounting height 80” minimum from drain to centerline of head pipe.

E. Locate shower curtain rod minimum 6’-3” AFF (verify with architect).

F. Locate floor service sink (mop sink) faucet rough-in at 36” AFF.

G. Locate water recessed valve boxes for refrigerators at 18” AFF.

H. Locate water recessed valve boxes for coffee makers per architectural plans.

I. Seal fixtures to wall and floor surfaces with silicon sealant, color to match fixture.

J. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

K. For ADA accessible water closets, install flush valve with handle to wide side of stall.

L. For ADA showers, recess shower enclosures into floor to obtain required accessible threshold dimension. Coordinate with architect on finish floor material and height. Provide the threshold with a finished appearance.

M. For showers installed on polished concrete floors, recess tile flange into floor for a finished threshold appearance.

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

SECTION 23 00 00

HVAC GENERAL CONDITIONS

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 37 00	Air Outlets and Inlets
23 40 00	HVAC Filters
23 72 00	Energy Recovery Units
23 81 43	Air-Cooled, Variable Refrigerant Flow, Multi-Unit Heat Pump
23 83 16	Electric Duct Coils
23 83 23	Electric Terminal Heating Units

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over mechanical installation.

1. Uniform Plumbing Code (UPC) with local amendments.
2. International Mechanical Code (IMC) with local amendments.
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.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed shall be submitted for approval, see Division 01.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and shall guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, “or approved” may be assumed for all products in Division 23.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 23 and all additional products noted on drawings or required for completion of sequence of operations.

B. Electronic: **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:
1. Product description
2. Manufacturer and model
3. Dimensions
4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
5. Construction Materials
6. Ratings (i.e. UL, ASTM, NEMA, etc)
7. Electrical data
8. Sound level data (corresponding to scheduled values)
9. Vibration Isolation
10. Controls and wiring diagrams
11. Accessories
12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves, fan curves)

F. Air Terminal Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include electrical characteristics and connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 inch to 4 inches wg.

G. If requested 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.

1.7 SHOP DRAWINGS

A. The Contractor shall submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract Drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent.

B. Submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under the section shall include (but not be limited to) the following, where applicable to this project:
1. Electrical interlock wiring diagrams.
2. Piping layout plans and interference details.

C. By submission of piping and ductwork shop drawings, the Contractor acknowledges that coordination has been done to ensure that all piping and ductwork fits and that no conflicts exist.

D. The Architect’s review of shop drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, unless he has, in writing,

called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.8 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 insure that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

C. Permit documents may include (but are not limited to) the following:
1. Mechanical Site Plan, Vicinity Map and Elevations.
2. Mechanical Load Calculations (Mechanical Consultant will provide load calculations to the Contractor).
3. Acoustical Reports. Mechanical Contractor shall obtain the required acoustical reports from the acoustical engineer for the project.
4. 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 SCHEDULING

A. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

1.15 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. Protect indoor chillers from weather by storing under roof.

K. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

L. Comply with contractor's construction Indoor Air Quality (IAQ) Plan.

1.16 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, tanks, or tank foundations 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.

F. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers. Maintain temperatures during and after installation of duct sealant.

G. Maintain water integrity of roof during and after installation of chimney or vent.

H. Do not install condensing unit foundation pad when ground is frozen or muddy.

1.17 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.

1.18 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. Filter installation shall be coordinated with the building flush-out.

M. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

N. Coordinate wall openings, piping rough-in locations, concrete housekeeping pads, and electrical rough-in locations to accommodate Work of this Section.

O. Coordinate all equipment with building control work.

P. Coordinate installation of
1. Condensing units with concrete pad and roof structure.
2. Air handling units with building structure.
3. Unit installation with roof structure, piping systems, and ceiling for unit access.
4. Roof curbs with roof structure, roof deck and roof membrane installation.

1.19 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.

1.20 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.

1.21 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

B. 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.

C. Power Wiring: By Electrical Contractor.

D. 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.

1.22 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.

1.23 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.

1.24 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 2 hours
   2. Control Systems 2 hours

1.25 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.

1.26 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.

1.27 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.

1.28 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

1.29 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.

1.30 WARRANTIES AND CONTRACTOR’S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.

C. Without cost to Owner, **correct all defects and failures discovered within one year from date of final acceptance**, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

E. Make all necessary balancing and control adjustments during first year of operation.

F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.

3.2 INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

C. Energy Code C104 specifically requires the following inspections.
1. Mechanical Equipment Efficiency and Economizer: To be made after all equipment and controls required by the Energy Code and this specification are installed and prior to the concealment of such equipment or controls.
2. Mechanical Pipe and Duct Insulation: To be made after all pipe and duct insulation is in place, but before concealment.
3. Motor Inspections: To be made after installation of all equipment covered by the Energy Code and this specification but before concealment.

3.3 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation for proper movement clearance.

3.4 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean ductwork and equipment.

3.5 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hangers and Supports.
2. Vibration and Seismic Controls.
3. Firestopping.
4. Condensate Pumps
5. Access Panels
6. Tags and Identification.

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 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 230700.
1. Manufacturer: Pipe Shields, INC or approved equal.
2. Material: Calcium Silicate or Uretherne per temperature application.
3. Thickness: Insert thickness shall match required insulation thickness per 230700.

B. Refrigerant Piping:
1. Hangers for rigid pipe: Carbon steel, adjustable swivel, split ring with Armacell Armafix insulated rigid insert.

2. Hangers for flexible pipe: Carbon steel, adjustable, clevis with Armacell Armafix insulated rigid insert and saddle.
3. Hangers for paired flexible pipe: Carbon steel, adjustable, clevis with 1" wide overlapping steel band and saddle.

2.3 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.4 INSERTS

A. Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 ACCESS PANELS

A. Milcor or approved equal.

B. Include an allowance for a minimum of 8 access panels.

C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.6 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
1. Ferrous Piping: Class 150, 300 psi CWP, malleable iron, threaded.
2. Copper Piping: Class 150, 300 psi CWP, bronze unions.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
4. PVC Piping: PVC.
5. CPVC Piping: CPVC.

2.7 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Metal Counterflashing: 22 gage thick galvanized steel.

C. Lead Flashing:
1. Waterproofing: 5 lb./sq. ft sheet lead.
2. Soundproofing: 1 lb./sq. ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

2.12 SUPPORT ACCESSORIES

A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

B. Swivel Joints: Steel / Bronze body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

2.13 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. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

2.14 FIRESTOPPING-APPLIED

A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.

B. General:
   1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
   2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
   3. Do not use any product containing solvents or that requires hazardous waste disposal.
   4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
   5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
   1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer's tested system.

2.15 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.

2.16 CONDENSATE PUMP

A. Manufacturer: BlueDiamond MicroBlue or approved equal.

B. GyRok pump technology, 1.3 gal/hr, 16 feet hd, 6 feet lift, 17 dba. Thermistor level sensing. Capable of running dry. Provide with reservoir and fascia kit (where noted).

2.17 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.

D. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

2.18 SPRING ISOLATION ROOF CURB (SEISMIC)

A. Manufacturers: Mason Type SRSC, Amber Booth, Vibro-Acoustics or approved.

B. Spring isolation type with rectangular steel tube lower member, continuous upper frame within "captive: guides to resist wind and seismic forces, adjustable and removable rust-resistant steel springs mounted on 1/4" neoprene pads and having minimum deflection of 2", plated or galvanized hardware, flexible aluminum seal weatherproofing and 2" insulation on lower curb.

C. Curb shall be built to seismically contain the rooftop unit.

2.19 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.

2.20 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)
Condensate	Black	White	CONDENSATE

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.

2.21 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.

2.22 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.

2.23 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.

2.24 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 - 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 23 07 00.

3.6 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.

3.7 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.

3.8 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.

3.9 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.

3.10 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.

3.11 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 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.

3.12 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.

3.13 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 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.

3.14 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.

3.15 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.

3.16 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.

3.17 INSTALLATION-VIBRATION ISOLATION

A. Install isolation for motor driven equipment.

B. Adjust equipment level.

C. Install spring hangers without binding.

D. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

E. 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.

3.18 INSTALLATION - SPRING ISOLATION ROOF CURB (SEISMIC)

A. Unit supported must be solidly fastened to the top floating rail and the lower section anchored to the roof structure. Mechanical contractor to hire third party structural engineer to provide exact number and size of bolts/fasteners and provide equipment seismic calculations.

B. Provide acoustical materials in bottom of curb as shown on plan detail.

3.19 INSTALLATION – CONDENSATE

A. For all cooling coils, high efficiency gas burners and other equipment requiring condensate drainage, provide appropriately sized condensate pumps where gravity drainage is not possible or where scheduled.

B. Coordinate number and type of condensate pumps required with Plumbing Contractor.

C. Provide condensate overflow switches on cooling coils where damage to building components could occur as a result of overflow as required by IMC.

D. For wall mounted fan coils, condensate pump, reservoir, wiring and piping shall not be exposed to view. Field fabricated concealment is not acceptable.

E. For pumps located in equipment cabinet, above ceiling, fascia kit or unfinished space, obtain power for condensate pump directly from electrical terminal block on unit served. Coordinate with electrical contractor.

F. For wall mount fan coils with pumps located above a ceiling, obtain power from electrical circuit. Coordinate with electrical contractor.

G. Connect condensate pump alarm wiring to unit served power terminals per manufacturer's installation instructions. Coordinate with electrical contractor. Unit served shall shut down when condensate reservoir is full to prevent overflow.

3.20 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.

3.21 CLEANING

A. Contractor shall make all mechanical components free of dust and dirt prior to startup.

3.22 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.23 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
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8
FRP (All Sizes)	4	3/8
Ductile Iron (Note 2)		
PVC (All Sizes)	4	3/8

C. Note 1:Refer to manufacturer's recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

3.24 SCHEDULES

A. Pipe Isolation Schedule:

Pipe Size Inch	Isolated Distance from Equipment diameters
1	120 diameters
2	90 diameters
3	80 diameters
4	75 diameters

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SCOPE

A. Testing, adjusting and balancing of air systems.

B. Testing, adjusting and balancing of Division 22 domestic water systems.

C. Measurement of final operating conditions of above systems.

D. Duct pressure (leakage) testing as required by 23 31 00.

E. Preparation of formal report.

1.2 PERFORMANCE CRITERIA

A. Work shall be performed by approved independent testing and balancing agency.

B. Perform testing and balancing in accordance with Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). All work shall be supervised.

C. Calibrate instruments used for testing and balancing within a period of six months of start of work.

D. Mechanical contractor shall assist Balancing Agency in testing and balancing of mechanical system.

1.3 SUBMITTAL

A. Provide three (3) copies of typed and bound report to be included in Preliminary Commissioning Report.

B. Provide three (3) additional copies of updated and/or corrected report for Final Commissioning Report.

1.4 FORMAT

A. Report shall consist of test sheets similar to AABC Standard Forms for Diffusers and Grilles, Air Handling Equipment, Exhaust Fans, and Pumps (i.e., Form 12666 for Diffusers and Grilles).

B. Report shall include the following.
   1. Preface suggesting abnormalities and problems encountered.
   2. Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
   3. System Identification reporting location of equipment, zones, supply, return, and exhaust openings.
   4. Record following for each piece of air handling equipment.
      a. Manufacturer, model number, and serial number.
      b. Design and manufacturer rated data.
      c. Actual CFM

d. Suction and discharge static pressure of each fan.
e. Outside-air and return-air total CFM.
f. Actual operating current, voltage, and brake horsepower of each fan motor.
g. Final RPM of each motor.
h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
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.	Hardin & Sons	253-862-6645

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and in good working order before commencing work. Then, put all systems and equipment into operation and continue operation until all adjusting, balancing, testing, demonstrations, instructions and cleaning of systems have been completed. Verify the following:
1. Systems are started and operating in safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.

10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balancing valves are open.

3.2 PREPARATION

A. If requested, conduct tests in presence of Architect.

B. Instruments used by Agency shall be accurately calibrated and maintained in good working order.

C. Furnish instruments required for testing, adjusting, and balancing operations including ladders, scaffolding, additional dampers and clean filters.

D. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

E. During balancing technician's initial test of air handling systems, the Mechanical Contractor shall have his sheetmetal foreman present to assist in any drive changes or dampers necessary.

3.3 INSTALLATION TOLERANCES

A. Diffuser, register and grille air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 50 cfm of design rates, whichever is less.

B. Fan air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 100 cfm of design rates, whichever is less.

C. Water flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 5 gpm of design rates, whichever is less.

D. Pump flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 25 gpm of design rates, whichever is less.

E. Two-speed fans: Balance fans and airflow control devices at both minimum and maximum airflow settings.

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. Pumps shall be proportionally balanced to minimize throttling losses, and then the pump impeller shall be trimmed or the pump speed modified to meet design flow conditions.

E. Check motors for proper rotation, coupling and drive alignment, belt tension and freedom from vibration, etc.

F. Provide belt drive/sheave changes to adjust fan rpm as necessary to accomplish design balances.

G. Verify recorded data represents actual measured or observed conditions.

H. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

I. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

J. Report defects and deficiencies noted during performance of services, preventing system balance.

K. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

L. 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 PLUMBING PROCEDURE

A. Domestic pump circulators:
1. Test total system GPM and head.
2. Adjust branch flows by circuit setters for equal flow distribution.

3.8 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.

3.9 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

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Piping system insulation.
2. Pipe insulation jackets.
3. Insulation accessories including vapor retarders and accessories.
4. Ductwork insulation.
5. Ductwork insulation jackets.
6. Duct liner.

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 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.

PART 2 PRODUCTS

2.1 GLASS FIBER, RIGID (PIPE)

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: reinforced facing, will accept paint. Seal with pressure sensitive tape.

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 (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.

2.5 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.

2.6 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.

2.7 PIPE INSULATION AND EQUIPMENT JACKETS

A. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, white color. ASTM D1784.
   2. Thickness: 15 mil indoor, 30 mil outdoor.
   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 flanges and unions with removable sections and jackets.

E. Piping Inserts and Shields:

1. Insulation shall be continuous through supports and hangers with incompressible inserts and shields. Do not directly clamp/support pipe scheduled to be insulated.
2. Shields: Galvanized steel saddle between pipe clevis hangers or pipe rollers and insulation. Minimum 6 inches long, of contour matching adjoining insulation; may be factory fabricated.
3. Inserts: Between pipe clamps, hangers or rollers and piping.
4. Insert material: Compression resistant insulating material suitable for insulation type and planned temperature range and service.
5. Glue insulation to both sides of insert.
6. Shields without inserts may be used at clevis hangers on refrigerant piping 5/8" and smaller with continuous insulation.

F. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Exterior Piping Applications: Use only elastomeric closed-cell foam insulation. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with sealant. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

I. Exposed Equipment: Locate insulation and cover seams in least visible locations.

J. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

K. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

L. Finish insulation at supports, protrusions, and interruptions.

M. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

N. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation/lagging with removable sections for easy removal and replacement without damage. Label removable sections indicating access type, i.e. "Filter Access".

O. Insulate exhaust air ductwork where it is outside the insulated building envelope to prevent condensation.

P. 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.

Q. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

R. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.

2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

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.
3. For all below grade piping application use only insulation specifically engineered for application. (Closed Cell Polyurethane System)

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**
Supply, Return	Attic, crawlspace, parking garage or uninsulated area within building. (Zone 4C)	Duct Wrap	3"	R-8	FSK
Supply, Return, Exhaust	Unconditioned space inside building envelope.	Duct Wrap	2.5"	R-6	FSK
Supply	Concealed Space (3)	Duct Wrap	1-1/2"	R-3.3	FSK
Supply	Exposed (4) in Space With Supply Air Temp ≤55 F or ≥105 F	Duct Wrap / Duct Liner	1-1/2"	R-3.3	FSK
Outside Air (5)	Within Building downstream of damper. <2800 cfm	Duct Wrap / Duct Liner	3"	R-8	FSK
Outside Air (5)	Within Building Between damper & building exterior.	Duct Wrap / Duct Liner	5.75”	R-16	FSK
Outside Air (ERV supply)	Between ERV & building spaces	Duct Wrap / Duct Liner	1-1/2"	R-3.3	FSK

Exhaust Air	Attic, crawlspace, parking garage or uninsulated area within building.	Duct Wrap	2.5"	R-6	FSK
Relief / Exhaust Air	Between damper & building exterior.	Duct Wrap	5.75”	R-16	FSK
Exhaust Air	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. Insulation is not required on sound lined ductwork with sufficient insulating value.
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.

C. Equipment: Provide on equipment as listed below.

Service	Insulation Type	Thickness	R-Value	Jacket
Valves, refrigerant pipe accessories.	Glass Fiber BLANKET	Per pipe schedule	-	Canvas bag with wire ties.

END OF SECTION

SECTION 23 08 00

PROJECT COMMISSIONING

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. Testing and startup of any appropriate plumbing systems, such as water heating plants, and circulation pumps.
4. Equipment control and system verification checks.
5. Air balancing.
6. Plumbing balancing, including hot water recirculation.
7. Functional performance testing.
8. Sequence of operations testing.
9. Completion of record drawings.
10. Owner training.
11. Operation & Maintenance materials.

12. Preliminary Commissioning Report with deficiencies noted.
13. 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. Service Water Heating Systems:
1. Perform testing under a minimum of 50% service load.
2. Verify function and setpoint of mixing valves.

H. Independently test all similar systems. Sampling reference systems is not acceptable.

I. 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

SECTION 23 09 00

INSTRUMENTATION AND CONTROL FOR HVAC

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 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.

2.2 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.

2.3 CONTROL AIR DAMPERS

A. See Section 23 33 00.

2.4 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.

2.5 CO/NO2 SENSOR

A. Manufacturer: AirTest Technologies (1-888-855-8880) or approved equal.

B. Controller (CT2100): Integrated dual sensing capability for two gases with two sets of relays for fan/alarm activation. LED indication of power, fault and 2 threshold indicators for each gas channel. 2-minute low on delay, 10 min low off delay and 5 minute high on delay. 24 VAC, NEMA 4X enclosure.

C. Integrated electrochemical CO sensor head (TR2000).

D. Remote NO2 Sensor: Electrochemical diffusion sensor in NEMA 4X enclosure, 0-10 ppm range, +/- 5% accuracy. (TR3210)

2.6 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

2.7 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.

2.8 ENCLOSURES

A. All enclosures to be UL listed and all metal construction. All controls and instruments logically assembled at one or more panels.

2.9 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.

2.10 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.

2.11 CONTROL POWER

A. Provide transformers to supply power for control equipment operating at less than normal lighting circuit voltage. Do not connect wiring to lighting circuits.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building systems to be controlled are ready to operate.

B. Verify air handling units and ductwork have been accepted and air filters are in place before installing sensors in air streams.

C. Verify location of thermostats, humidistats and other exposed control sensors with Drawings before installation.

3.2 COORDINATION

A. Furnish all control products to accomplish the specified sequence of operation, except those products specifically furnished under other sections.

B. Install all control products and connections, except where already installed by the equipment manufacturer.

C. Thermostats located in electrical transformer vaults shall be model approved by electrical utility.

D. 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, humidistat, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work.

E. Install freeze protection thermostats using flanges and element holders.

F. Install outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

G. Provide separable sockets for liquids and flanges for air bulb elements.

H. Install thermostats in aspirating boxes in public areas and as indicated on Drawings.

I. 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.

J. 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

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Refrigerant piping.
2. Pipe insulation protection.
3. Valves.
4. 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. Flexible Connectors: Use at spring isolated air handlers and condensers greater than six tons.

D. 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: Parker Hannifin – Zoomlock

B. Flame-Free press fittings: UL 207 Listed. Refrigerant Grade Copper in accordance with ASTM B75 or ASTM B743. O-Rings: HNBR.

C. Tools: Manufacturer's approved special tools.

D. Ratings:
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, M, L, K.
2. Soft (Annealed) Copper 1/4 to 1-3/8 inch (6.4 to 35 mm): Type ACR, L, K.

2.3 REFRIGERANT LINE SET

A. Copper Tubing: ASTM B280, annealed, Type ACR
1. Flared ends with brass nuts and protective caps.
2. Pre-insulated, dual tube, liquid and vapor lines with closed-cell elastomeric foam.
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 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.

2.9 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.

2.10 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.

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. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

R. Fully charge completed system with refrigerant after testing.

S. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

T. 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 Valves: Install service valves on compressor suction and discharge.

B. Strainers: Install shut-off valves on each side of strainer.

C. Install pressure relief valves on ASME receivers. Install relief valve discharge piping to terminate outdoors.

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

SECTION 23 31 00

HVAC DUCTS AND CASINGS

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. Fasteners: Rivets, bolts, or sheet metal screws.

C. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 INSULATED FLEXIBLE DUCTS

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. Joints: 16” and larger flange with gasket material.

D. Elbows: Smooth radius or 5 section, 1.5D.

E. 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.

F. Construct duct with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	26

G. Construct fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24

2.4 SINGLE WALL ROUND DUCTS

A. Manufacturers: Ductmate GreenSeam+ or approved equal.

B. Product Description: Snap lock round duct with self-sealing butyl rubber longitudinal seam and polyurethane gasket transverse seam. No external sealant. No VOCs.

C. Joints: Male/Female with integral gasket.

D. Elbows: Smooth radius, 1.5D.

E. Application: Only allowed for low pressure ductwork with static pressure of 1” w.g. or less, less than 10” diameter and concealed. Not for use exposed.

F. Construct duct with the following minimum gages:

Diameter	Gauge
4 inches to 10 inches	26

G. Construct fittings with the following minimum gages:

Diameter	Gauge
4 inches to 10 inches	24

2.5 SINGLE WALL ROUND DUCTS (SNAP-LOCK)

A. Not for use.

2.6 DUCT SEALANT

A. Manufacturer: Design Polymerics, United McGill or approved equal.

B. Sealant shall be water based and formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under ASTM C 732 (artificial weathering) and pass ASTM C 734 (low temperature flexibility after artificial weathering). All sealants shall be of an elastomeric nature, have a weight per gallon not to exceed 12.5, have solids by weight of 66% ± 2%, pass UL 723 with a flame spread of 5 and smoke developed of 5.

2.7 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.

2.8 CLOTHES DRYER EXHAUST DUCTWORK

A. Rigid galvanized sheet metal of minimum 26 gauge with smooth interior finish.

2.9 KITCHEN HOOD EXHAUST DUCTWORK FABRICATION

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and NFPA 96.

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. 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.

H. 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.

I. Install duct hangers and supports in accordance with Section 23 05 00.

J. 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 CLOTHES DRYER DUCT INSTALLATION

A. Ducts shall terminate outside the building and be equipped with a backdraft damper. No screens shall be used at termination.

B. Ducts shall not be constructed with sheet metal screws or other fasteners that enter the airstream. Ductwork shall be metal with smooth interior finish. The male end of duct joints shall extend in the direction of airflow.

C. Dryer ducts which penetrate a wall of ceiling membrane shall be fire caulked.

D. Dryer ducts shall be supported at minimum 4 foot intervals and secured in place.

E. Provide protective shield plates where duct is in concealed locations within framing. Plates shall be 16 gage steel and cover the duct area plus 2”. Shields may be omitted if duct is more than 1-1/2” from nearest edge of structural member.

3.7 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.

3.8 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.

3.9 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply, Return, Exhaust, Relief	Galvanized Steel, Aluminum
Outside Air Intake	Galvanized Steel
Combustion Air	Galvanized 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

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Dampers
2. Dryer Box
3. Duct access doors
4. 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 REMOTE OPERATED BALANCING DAMPERS (MANUAL)

A. Manufacturers: Young, MAT or approved equal.

B. Damper:
   1. Round butterfly or radial damper with external control hardware, 5020-CC, RT-250.
   2. Round butterfly or radial damper with internal control hardware, 5020-CC-2, RT-150.
   3. Rectangular opposed blade damper with external control hardware, 830A-CC, RT-200.
   4. Rectangular opposed blade damper with internal control hardware, 830A-CC-2, RT-100.

C. Remote Damper Operator:
   1. External cable control, 3" cover plate, 270-301
   2. Internal cable control, 270-275
   3. Remote cable wall control, 700 (where indicated).

2.5 COMBINATION FIRE AND SMOKE DAMPERS (INLINE)

A. Manufacturers: Ruskin FSD60/FSD60LP, FSDR60, equal by Greenheck, or approved equal.

B. Application: Provide FSD60LP (low pressure) model for dampers 14" in height and smaller. Provide FSDR60 for round ducts. All others provide standard FSD60.

C. Fabricate in accordance with NFPA 90A, UL 555, and UL 555S.

D. Fire Resistance: 1-1/2 hours or 3 hours depending on rating of wall.

E. Leakage Rating: Class I, maximum of 8 cfm at 4 inches w.g. differential pressure.

F. Damper Temperature Rating: 350 degrees F.

G. Frame: 16 gage, galvanized steel.

H. Blades:
   1. Style: Airfoil-shaped, single piece, double skin.
   2. Action: Opposed.
   3. Orientation: Horizontal.
   4. Material: Minimum 16 gage equivalent thickness, galvanized steel.
   5. Width: Maximum 7 inches.

I. Bearings: Stainless steel or bronze.

J. Seals: Silicone blade edge seals and flexible stainless steel jamb seals.

K. Linkage: Concealed in frame.

L. Provide with duct transition connection.

M. Release Device: Close in controlled manner and allow damper to be reset.

N. Actuator: Belimo, electric 120 volt, 60 hertz, two-position, fail close.

O. Resettable Link Release Temperature: 165 degrees F.

P. Factory installed sleeve and mounting angles. Furnish silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.

Q. Accessories:
1. Damper Test Switch

2.6 DRYER BOX

A. Manufacturers: Guy Gray, In-O-Vate Technologies or approved equal.

B. 22 gauge aluminized steel manufactured wall recessed dryer vent hose receptacle with opening for 4" dia. duct and gas line. UL Classified for a one hour wall. Installation per manufacturer's instructions.

2.7 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.

2.8 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. Install remote operated dampers for balancing where damper is located in an inaccessible location.

H. 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.

I. 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.

J. 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.

K. Install fire dampers, combination fire and smoke dampers and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
2. Install dampers square and free from racking with blades running horizontally.
3. Do not compress or stretch damper frame into duct or opening.
4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
6. Coordinate fire/smoke damper and smoke damper with Fire Alarm Contractor for smoke detector activation and fire alarm system integration. Install any duct smoke detectors furnished by Fire Alarm Contractor.

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

SECTION 23 34 00

HVAC FANS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fans.

1.2 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, 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.
2. Accessories:
   a. Gravity backdraft \ 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

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.
2. Accessories:
   a. Gravity backdraft \ Motorized Control damper. (See Part I, Dampers)
   b. Nema rated disconnect switch.
   c. Insulated housing with 1" liner.
   d. Speed Control.
   e. Neoprene isolators

2.3 RESIDENTIAL KITCHEN EXHAUST HOOD

A. Twin plastic or steel centrifugal fans mounted in steel factory finished hood. HVI rated and UL approved. Broan, Nutone, or approved.

B. Accessories:
1. 100 watt light with bulb.
2. Washable filters.

2.4 EQUIPMENT RAIL SUPPORTS

A. Manufacturers: Greenheck GESR or approved equal.

B. Prefabricated insulated galvanized steel equipment support. [4] [6] [8] inch width. Provide with same coating as fan, otherwise Polyester Urethane. Select height based on roofing and insulation requirements. Select length based on equipment supported.

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.

E. Provide sheaves required for final air balance.

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

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Diffusers, Registers & Grilles
2. Louvers

1.2 QUALITY ASSURANCE

A. Diffuser, register, and grille performance shall be tested and rated in accordance with ASHRAE 70.

B. Louver performance shall be tested and rated in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 LOW-FLOW RECTANGULAR CEILING DIFFUSER (Outside Air)

A. Manufacturers: Titus TJD or approved equal.

B. Type: Square plaque, induction nozzles, removable face panel.

C. Frame: 24”x24” module for lay-in T-bar ceilings or plaster frame for surface mount GWB ceiling.

D. Fabrication: Steel with baked enamel white finish.

E. Accessories:
1. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.

2.2 RADIAL TWIST INDUCTION CEILING DIFFUSER (Outside Air)

A. Manufacturers: Price RTD or approved equal.

B. Type: Radial twist diffuser with high induction vortex pattern, square face.

Frame: 24”x24” module for lay-in T-bar ceilings.

C. Fabrication: Galvanized steel with white powder-coated finish.

D. Accessories:
1. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.

2.3 EXHAUST/ RETURN GRILLE

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Fixed blades, 1/2 inch blade spacing, with blades set at 35 degrees.

C. Frame: 1-1/4 inch margin with countersunk screw mounting, welded corners.

D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, with factory white enamel finish.

E. Accessories:
1. Opposed blade damper.
2. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.

2.4 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.

2.5 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. Wall Cap (round connection): Aluminum construction, aluminum finish, built in birdscreen with damper. Greenheck WC or approved equal.

C. Wall Cap (rectangular): Steel construction with black enamel finish, built in birdscreen with damper. Greenheck WC 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

SECTION 23 40 00

FILTERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Disposable, pleated filters.

1.2 PERFORMANCE REQUIREMENTS

A. Conform to ARI 850 Section 7.4.

B. Dust Spot Efficiency: Plus or minus 5 percent.

PART 2 PRODUCTS

2.1 DISPOSABLE, PLEATED FILTERS

A. Manufacturers: Camfil, Flanders, Airguard, Viledon or approved equal.

B. MERV 8: UL 900 Class 2, pleated, cotton and polyester blend, radial pleat with welded wire grid, cardboard frame. 1”, 2” & 4”. (Camfil 30/30)

C. MERV 13 (85%): UL 900 Class 2, pleated synthetic media with three layers, spunbond polyester prefilter, electrostatically spunpolycaronate microfiber middle layer and spunbond polyester downstream layer. 2” & 4” (Viledon Mini 85)

PART 3 EXECUTION

3.1 INSTALLATION

A. Install filters with felt, rubber, or neoprene gaskets to prevent passage of unfiltered air around filters.

B. Do not operate fan system until filters are in place. Replace filters used during construction before testing, with clean set. Provide owner with replacement set of filters.

END OF SECTION

SECTION 23 72 00

ENERGY RECOVERY UNITS

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.

C. Energy Wheel shall be AHRI Certified per Standard 1060.

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.
2. One set of fan and energy wheel belts

1.5 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

PART 2 PRODUCTS

2.1 CORE AIR TO AIR ENERGY RECOVERY UNIT (ERV)

A. Manufacturers: Greenheck ECV-PM or approved equal.

B. General: Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, outdoor air intake weatherhood with metal mesh filters, energy core, motorized intake damper, motorized exhaust damper, sensors, curb assembly, filter assembly for

intake and exhaust air, supply air blower assembly, exhaust air blower assembly and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

C. Cabinet: Formed double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance. Outside casing: 18-gauge galvanized steel, factory pre-painted with polyester urethane paint (permatector).
   1. ECV-10 internal assemblies: 24-gauge, galvanized (G90) steel. Direct drive motor provided with a fabricated belly band for motor support.
   2. Access doors shall be hinged.
   3. Provide factory-installed duct flanges on all duct openings.
   4. Cabinet Insulation: 1” Fiberglass insulation. Full coverage of entire cabinet exterior to include walls, roof and floor of unit. Insulation shall be of semi-rigid type and installed between inner and outer shells of all cabinet exterior components.

D. Energy Core: Energy core shall be of total enthalpy and shall be removable from the cabinet. The core media shall be a corrugated polymer membrane in a galvanized steel framework and can be removable for servicing. The energy core is to have a five year warranty. Performance criteria are to be as specified in AHRI Standard 1060.

E. Blowers: Assembled onto a 14-gauge galvanized steel platform with neoprene vibration isolation devices. Assemblies shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.

F. Motors: Electronically commutated (EC) motor specifically designed for fan applications. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.

G. Frost Control: Timed Exhaust – control system shall include an outdoor air thermostat to initiate frost control sequence, shutting down outdoor air fan and running exhaust fan only. Sequence will continue for 5 minutes every 30 minutes.

H. Motorized dampers: Exhaust Air and Intake Air AMCA Class 1A motorized dampers of insulated low leakage type shall be factory installed.

I. Filter Section: Permanent 2” aluminum filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 13 pleated filters shall be provided in the intake air stream and MERV 8 filters in the exhaust air stream.

J. Sensors which are part of various optional operational modes or device controllers and are to be factory supplied and installed.

K. Curb Assembly: 14-gauge galvanized steel factory curb shall provide perimeter support of the entire unit. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide

protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly.

L. Control panel: Unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connection.
   1. The unit shall be constructed so that it can function as a stand-alone heating system controlled by factory-supplied microprocessor programmable controller, thermostats and sensors.
   2. Remote Interface: Contractor shall provide and install a Remote Interface that functions as a remote indicator of owner-selected operating parameters and also permits remote inputting of new operating parameters. Each remote panel shall have a large LCD user interface screen.
   3. Sensors:
      a. Dirty Filter Sensors
      b. Temperature Sensors- OA, SA, RA, EA

M. Accessories:
   1. Seismic vibration isolation curb.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof curbs are installed and dimensions are as instructed by manufacturer.

3.2 PREPARATION

A. Furnish roof curbs for installation.

3.3 INSTALLATION

A. Secure unit with cadmium plated steel lag screws to roof curb.

B. 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.

C. Provide sheaves required for final air balance.

3.4 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.

3.5 CLEANING

A. Vacuum clean coils and inside of fan cabinet.

B. Install clean filters.

3.6 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.7 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

SECTION 23 81 43

AIR-COOLED, VARIABLE REFRIGERANT FLOW, MULTI-UNIT HEAT PUMP

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. System Description
2. Outdoor unit
3. Indoor units
4. Digital Controls
5. Condensate Overflow Switch

1.2 MAINTENANCE SERVICE

A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.

B. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.3 QUALITY ASSURANCE

A. Capacity rating in accordance with ARI.

B. Sound rating is accordance with ARI 270.

C. Insulation and adhesives: Meet requirements of NFPA 90A.

1.4 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

1.5 QUALIFICATIONS

A. The system shall be installed by a Trane-Mitsubishi authorized CITY MULTI Diamond Dealer. The contractor service and install training should be performed by the manufacturer.

1.6 WARRANTY

A. System shall obtain Diamond ten (10) year extended warranty.

B. Warranties periods shall be from date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Trane-Mitsubishi CITY MULTI or approved equal.

B. Fan: Direct drive, variable speed propeller type fan with inherent protection, permanently lubricated bearings, mounted for quiet operation, raised guard and vertical discharge airflow.

2.2 OUTDOOR CONDENSING UNIT (3 TO 5 TONS)

A. General: Variable capacity, heat pump system capable of single or multiple zones.

B. Units shall be equipped with multiple circuit boards that interface to the control system and shall perform all functions necessary for operation, be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
1. Sound pressure rating no higher than 59 dB(A).
2. All refrigerant lines shall be individually insulated.
3. Accumulator with refrigerant level sensors and controls.
4. High pressure safety switch, over-current protection and DC bus protection.
5. Capable of operating in heating down to -13°F ambient temperature without additional low ambient controls.
6. High efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

C. Unit Cabinet: The casing shall be fabricated of galvanized steel, bonderized and finished with powder coated baked enamel.

D. Fan: Direct drive, variable speed propeller type fan with inherent protection, permanently lubricated bearings, mounted for quiet operation, raised guard and horizontal discharge airflow.

E. Refrigerant: R410A refrigerant is required.

F. Coil: Nonferrous construction with lanced or corrugated plate fins on copper tubing with an integral metal guard. Fins shall have corrosion resistant blue-fin finish.

G. Compressor: High performance, inverter driven, modulating capacity scroll compressor with a factory mounted crankcase heater, an inverter to modulate capacity, internal thermal overload, mounted to avoid the transmission of vibration.

H. Electrical: The unit shall be controlled by integral microprocessors with the control circuit between the indoor units and the outdoor unit being 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.3 TPKFY INDOOR UNIT (wall-mounted)

A. General: Wall mounted indoor unit section with a slim silhouette and a modulating linear expansion device.

B. Indoor Unit: Factory assembled, wired and run tested with all factory wiring, piping, electronic modulating linear expansion device, control circuit board, fan motor, self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet: White finish, same for all model sizes. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining. Separate back plate which secures the unit firmly to the wall.

D. Fan: An assembly with one or two line-flow fan(s) direct driven by a single motor. Statically and dynamically balanced to run on a motor with permanently lubricated bearings. Multi-speed fan with two speeds selected by the room controller. Manual adjustable guide vane with the ability to change the airflow from side to side (left to right). Motorized air sweep louver with automatic change in airflow by directing the air up and down to provide uniform air distribution.

E. Filter: Factory installed MERV 4.

F. Coil: Nonferrous construction with smooth plate fins on copper tubing, inner grooves for high efficiency heat exchange, phos-copper or silver alloy brazed joints, pressure tested at the factory. A condensate pan and drain shall be provided under the coil. Both refrigerant lines to the PKFY indoor units shall be insulated.

G. Controls: Unit controls to be provided with unit as part of VFRZ system to perform functions necessary to operate the system. The unit shall be able to control external backup heat.

H. Accessories:
1. Provide with BlueDiamond condensation pump complete with reservoir and accessories. Provide model MicroBlue for units up to 15 MBH and MaxiBlue for units 18 MBH and larger. Provide power from fan coil unit.

2.4 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.

2.5 CONTROLS

A. General: The physical controllers shall be plastic material with a neutral color. Each remote controller, at a minimum, shall have a LCD (Liquid Crystal Display) that shows room temperature, set point, and fan speed.

B. Electrical:
1. The electrical voltage from each circuit board to the controls shall be 12 volts DC.
2. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the BC controller and outdoor unit. Control wiring shall run from the indoor unit terminal block to the controller associated with that unit.
3. Wiring shall be 2-conductor 16 AWG or 18 AWG stranded wire with a shield, as defined by control drawing.

2.6 REMOTE CONTROLLERS

A. 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.

B. TAR-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.

2.7 CONDENSATE PUMPS

A. See Section 230500.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate size and location of concrete pad for condensing unit. Provide inserts for mounting.

B. Coordinate size and location of sleeves or block-outs needs for refrigerant piping.

C. Determine refrigerant pipe routing to efficiently minimum run length and avoid interference.

3.2 INSTALLATION

A. Install condensate piping with trap and determine route from drain pan to nearest waste with 1/4" slope. Provide condensate pump where drain is not available or slope cannot be made.

B. Install components furnished loose for field mounting.

C. Install condensing units at grade on concrete foundations with anchors.

D. Install refrigerant piping from condensing unit(s) to branch controller(s) and from branch controller(s) to indoor units. Install refrigerant specialties furnished with unit.

E. Insulate both liquid and vapor refrigerant piping on all runs.

F. Evacuate refrigerant piping and install initial charge of refrigerant.

G. Install electrical devices furnished loose for field mounting.

H. Install control wiring between air handling unit, condensing unit, and field installed accessories.

3.3 INSTALLATION – CONTROLS

A. Set control of equipment based on room controller space temperature rather than default return air temperature.

B. Setup Ethernet access via local area network. Coordinate setup for remote access with IT.

C. Setup output of error message notification via email, coordinate with owner for address.

D. Designate Fan Coils with unit tag and room/space name.

E. Setup occupied and unoccupied space temperature schedules with 2 hour interval occupied sweep and second unoccupied temperature sweep. Coordinate schedules with Owner.

F. Provide graphical floor plans for central controller display. Show locations of fan coils on plan with equipment tag.

3.4 INSTALLATION - CONDENSATE PUMPS

A. See Section 230500.

3.5 MANUFACTURER'S FIELD SERVICES

A. Furnish initial start-up and commissioning. During first year of operation, including routine servicing and checkout.

3.6 CLEANING

A. Vacuum clean coils and inside of unit cabinet.

B. Install new filters in indoor units at Substantial Completion.

3.7 DEMONSTRATION

A. Demonstrate system 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.

3.8 PROTECTION OF FINISHED WORK

A. Do not operate indoor units during construction for temporary heat.

B. Do not operate indoor units until ductwork and room is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 23 83 16

ELECTRIC DUCT COILS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Electric duct coils.

PART 2 PRODUCTS

2.1 ELECTRIC COILS

A. Manufacturers: Brasch, Indeeco, Neptronic, Greenheck or approved equal.

B. Assembly: UL listed and labeled, with terminal control box and hinged cover, splice box, coil, casing, and controls.

C. Coil: Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings and stainless steel terminals.

D. Casing: Channel frame of galvanized steel with brackets, stiffening ribs and gussets welded to frame. Flange duct connection unless noted otherwise.

E. Controls: Automatic reset thermal cut-out, built-in magnetic disconnecting contactors (3-poles), control circuit transformer and fuse, secondary replaceable thermal cut-out, air flow proving device, fused disconnect.

F. Accessories:
1. Insulated terminal box
2. SCR control
3. Door interlock switch
4. Pilot lights

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify ductwork is ready for installation.

B. Verify concealed blocking and supports are in place and connections are correctly located.

3.2 INSTALLATION

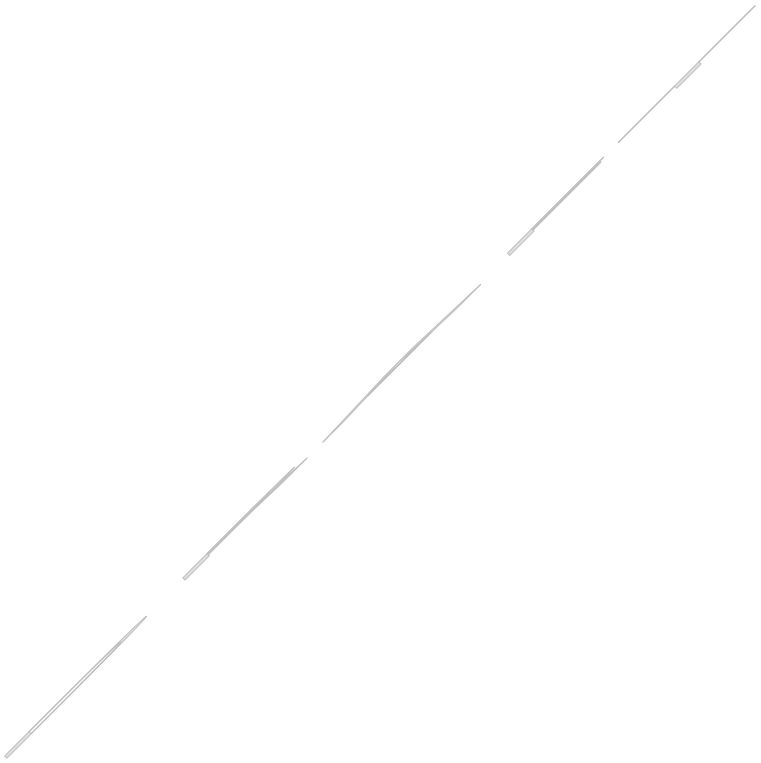
A. Install air coils in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

B. Protect coils to prevent damage to elements.

C. Install coils level.

D. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.

END OF SECTION



SECTION 23 83 23

ELECTRIC TERMINAL HEATING UNITS

1.1 GENERAL

1.2 SUMMARY

A. Section Includes:
1. Electric wall heaters.

PART 2 PRODUCTS

2.1 FORCED AIR WALL HEATER (Tamperproof)

A. Manufacturers: Markel, Cadet, Brasch or approved equal.

B. Heavy gauge housing and frame with sealed tubular heating element, thermal overload cut-off, fan delay switch, built-in tamperproof thermostat, vane axial blower. UL listed.

PART 3 EXECUTION

3.1 EXAMINATION

A. For recessed units, verify recess dimensions are correct size.

B. Verify wall construction is ready for installation.

C. Verify concealed blocking and supports are in place.

3.2 INSTALLATION

A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

B. Protection: Install finished cabinet units with protective covers during remainder of construction.

C. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.

3.3 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 26 00 00

ELECTRICAL GENERAL CONDITIONS

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: Provide electrical system upgrades and alterations for a renovation to the existing fire station in Machias WA. Electrical Systems to include but not limited to: power distribution system, permanently installed generator sized to carry the load of the entire facility, lighting, branch circuitry & devices and other infrastructure for all low voltage systems.

B. 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.
   1. The Fire Alarm and Low Voltage Design-Build Contractor(s) shall be subcontractor(s) to the Electrical Contractor.
   2. Fire Alarm:
      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.
   3. 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.

C. 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 these specifications and drawings. Work includes, but is not limited to, that as delineated in the following specification sections:

26 00 00 ELECTRICAL GENERAL CONDITIONS.

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

26 05 26 GROUNDING AND BONDING.

26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL AND LOW VOLTAGE SYSTEMS.

26 05 43 UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL AND LOW VOLTAGE SYSTEMS.

26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS.

26 05 73 ELECTRICAL SYSTEMS STUDIES.

26 09 23 LIGHTING CONTROL DEVICES.

26 24 16 PANELBOARDS.

26 27 26 WIRING DEVICES.

26 28 13 FUSES AND ENCLOSED SWITCHES AND CIRCUIT BREAKERS.

26 32 13 DIESEL ENGINE GENERATORS

26 36 00 TRANSFER SWITCHES

26 51 19 INTERIOR AND EXTERIOR LIGHTING

Division 27 and 28 Specification Sections (See 27 00 00 and 28 46 00 for complete lists).

D. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

E. 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. / Washington Cities Electrical Code.
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. Federal Acquisition Regulation (FAR).
    e. Institute of Electrical and Electronics Engineers (IEEE).
    f. National Electrical Manufacturer’s Association (NEMA).

g. 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.

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 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 and Electrical Design-Build Contractors 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. 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) Panel Schedules, Mechanical Connection Schedules, etc.
3) Electrical Single-Line Diagram.
4) Power Sheets.
5) Lighting Sheets.
   a) Lighting sheets shall include illuminance calculations for emergency and non-emergency conditions showing compliance with Code requirements and IESNA recommendations.
6) Low Voltage Systems (Telecom, CATV, etc) floor plan drawings.
7) 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, Arc Flash and Coordination Studies 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.

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 (panelboards, etc).
   2. For Lighting Control Systems.
   3. Generator Acoustic Enclosure
   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 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 COMMISSIONING

A. See Division 01 and Sections 26 08 00 and 27 08 00 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.

1.11 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 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.

1.12 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 (receptacles, circuit breakers, electrical gear, etc) from one manufacturer.

1.13 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.

1.14 SCHEDULING

A. Coordinate and provide assistance in final adjustment and testing of life safety systems with the General Contractor and Fire Authority.

1.15 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.

1.16 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.

1.17 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.

1.18 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. Electrical 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. Coordinate trenching, excavating, bedding, backfilling of buried systems with the requirements of the Contract Documents.

L. Coordinate wall openings, rough-in locations, concrete housekeeping pads, and conduit rough-in locations to accommodate Work of Divisions 26, 27 and 28.

M. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

N. 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.

O. 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.

P. 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.

Q. The Electrical Contractor shall coordinate with the mechanical and plumbing contractors to ensure that the electrical services and disconnects/starters/etc for all HVAC and plumbing equipment are appropriately sized and that all HVAC and plumbing loads are included in the electrical load calculations.

R. 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.

S. 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.

T. 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.

1.19 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 and Commissioning Report.
9. Warranty.

B. See other Division 26, 27 and 28 Specification Sections for additional requirements.

C. See Division 01 for additional requirements.

1.20 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.	Generator/ATS Power Systems	2 hours
b.	Lighting Control Systems	1 hour
c.	Fire Alarm Systems	See Section 28 46 00
d.	Low Voltage Systems	See Section 27 00 00

1.21 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.

1.22 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.

1.23 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.

1.24 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.

B. Submit three (3) copies of the preliminary commissioning report as required by the Washington State \ Seattle Energy Code and as outlined on drawing commissioning notes and specifications. This report is an execution and fulfillment of the commissioning plan. This report shall be completed before the final electrical permit inspection. At a minimum this report shall include:
   1. Testing reports for systems required to be commissioned.
   2. Complete system startup checklists.
   3. Functional test reports.
   4. Sequence of Operation test reports.
   5. O&M Materials.
   6. Record Drawings.
   7. Owner training documentation.
   8. Notes of any discrepancies observed during testing and any corrective actions taken or date when corrective action will be taken.
   9. Notes of any tests which could not be performed due to conflicts (identify specific conflict that prevented testing from occurring).

C. 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.

1.25 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 drawings for submittal.

3.2 MOCK-UPS

A. The Electrical Contractor shall completely mock-up areas to be chosen by the Architect and Owner 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 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 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

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

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 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.

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. Cooper B-Line, Inc.
   3. ERICO Global Company; part of Pentair.
   4. O-Z / Gedney; Emerson Electric Co.
   5. Thomas & Betts Corporation.
   6. 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, Type 304 / stainless steel, Type 316 / 6063-T5 aluminum alloy.
      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 or Type 304 / stainless steel or Type 316 / 5052-H32 aluminum alloy.
   4. Coatings:
      a. Metallic: Hot-dip galvanized after fabrication; applied per MFMA-4 / 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 / Stainless 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. Neoprene Pad Isolators:
2. 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.
3. 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.
4. 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.
5. 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.

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

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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. Fire-alarm wire and cable.
7. 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. Cerro Wire LLC.
2. Encore Wire Corporation.
3. General Cable Corporation.

4. 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 USE-2 and Type SE: Comply with UL 854.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type UF: Comply with UL 83 and UL 493.
4. 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 USE-2 and Type SE: Comply with UL 854.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. 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 smaller than #4 AWG: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
2. Feeders #4 AWG and Larger: 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 smaller than #4 AWG: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
2. Feeders #4 AWG and Larger: 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 FIRE-ALARM WIRE AND CABLE

A. MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:
1. Allied Wire & Cable, Inc
2. Comtran Corporation.
3. Genesis Cable Products; Honeywell International, Inc
4. Pyrotenax.
5. Superior Essex, Inc.
6. West Penn Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG or as recommended by system manufacturer].
1. 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.

D. 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.
   1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
   2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.8 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:
   1. 3M; Electrical Products Division.
   2. ABB, Electrification Products Division.
   3. AFC Cable Systems, Inc.
   4. Hubbell Power Systems, Inc.
   5. O-Z/Gedney; EGS Electrical Group LLC.
   6. 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: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

E. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

F. 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.

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 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 INSTALLATION OF FIRE-ALARM WIRING

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method:
1. 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.
2. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is permitted other than at open ceiling areas.
3. Signaling Line Circuits: Power-limited fire-alarm cables shall not be installed in the same cable or pathway as signaling line circuits.

C. 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 fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another 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. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.

G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function. Confirm requirements with Design-Build Fire Alarm Contractor.

3.5 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.

3.6 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.

3.7 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.

3.8 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."

3.9 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 conduc-

tors feeding the following critical equipment and services for compliance with requirements:
a. Permanently Installed Generator.
b. Portable Generator Dock.
c. Automatic Transfer Switch.
d. UPS.
e. UPS transformer.
f. UPS panelboard.

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

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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. Burndy; Hubbell Incorporated.
3. ERICO.
4. Harger Lightning & Grounding.
5. ILSCO.
6. O-Z/ Gedney; Emerson Electric, Co.
7. Siemens Industry, Inc.

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).

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. 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. See Grounding System connections on One-Line Drawing.

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. See Grounding System connections on One-Line Drawing.

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. Pad-Mounted Transformers: Ground all utility infrastructure per Utility requirements. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes.

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. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare copper, as indicated on the design drawings.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 FENCE GROUNDING

A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:
   1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
      a. Gates and Other Fence Openings: Ground fence on each side of opening.
         1) Bond metal gates to gate posts.
         2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (460 mm) below finished grade.

B. Grounding Method: See E61-series drawings.

C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

3.7 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. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
   2. 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.

3.8 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

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

B. Related Requirements:
1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
2. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings:
1. For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.
2. For conduit and raceway support systems, stamped and signed by a Structural Engineer currently registered in the State of Washington.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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.
   4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. CONDUITS AND FITTINGS:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AFC Cable Systems, Inc.
      b. Allied Tube & Conduit; a Tyco International Ltd. Co.
      c. Carlon, by ABB.
      d. O-Z/Gedney; a brand of EGS Electrical Group.
      e. Prime Conduit, Inc.
      f. Republic Conduit.
      g. Southwire Company
      h. Thomas & Betts Corporation.
      i. Western Tube and Conduit Corporation.
      j. Wheatland Tube Company; a division of John Maneely Company.

B. METAL WIREWAYS AND AUXILIARY GUTTERS:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper B-Line, Inc.
      b. Hoffman; a Pentair company.
      c. Mono-Systems, Inc.
      d. Square D; a brand of Schneider Electric.

C. SURFACE RACEWAYS
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hubbell Incorporated.
      b. MonoSystems, Ins.
      c. Wiremold/ Legrand.

D. BOXES, ENCLOSURES AND CABINETS:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlon, by ABB.
   b. Cooper Technologies Company; Cooper Crouse-Hinds.
   c. EGS/Appleton Electric.
   d. Hoffman; a Pentair company.
   e. Hubbell Incorporated; Killark Division.
   f. Milbank Manufacturing Co.
   g. Mono-Systems, Inc.
   h. O-Z/Gedney; a brand of EGS Electrical Group.
   i. RACO; a Hubbell Company.
   j. Thomas & Betts Corporation.
   k. Wiremold / Legrand.

2.2 METAL CONDUITS AND FITTINGS

A. Metal Conduit:
   1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. GRC: Comply with ANSI C80.1 and UL 6.
   3. ARC: Comply with ANSI C80.5 and UL 6A.
   4. IMC: Comply with ANSI C80.6 and UL 1242.
   5. PVC-Coated Steel Conduit: PVC-coated rigid steel cond**uit**.
      a. Comply with NEMA RN 1.
      b. Coating Thickness: 0.040 inch (1 mm), minimum.
   6. EMT: Comply with ANSI C80.3 and UL 797.
   7. FMC: Comply with UL 1; zinc-coated steel.
   8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:
   1. Comply with NEMA FB 1 and UL 514B.
   2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   3. Fittings, General: Listed and labeled for type of conduit, location, and use.
   4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
   5. Fittings for EMT:
      a. Material: Steel or die cast.
      b. Type: Setscrew.
   6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
   7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.3 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:
   1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Fiberglass:
      a. Comply with NEMA TC 14.
      b. Comply with UL 2515 for aboveground raceways.
      c. Comply with UL 2420 for belowground raceways.
   3. ENT: Comply with NEMA TC 13 and UL 1653.
   4. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated or required by utility service provider.
   5. LFNC: Comply with UL 1660.
   6. Rigid HDPE: Comply with UL 651A.
   7. Continuous HDPE: Comply with UL 651A.
   8. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D3485.
   9. RTRC: Comply with UL 2515A and NEMA TC 14.

B. Nonmetallic Fittings:
   1. Fittings, General: Listed and labeled for type of conduit, location, and use.
   2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
      a. Fittings for LFNC: Comply with UL 514B.
   3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated or required by Code, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be Type 3R and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Screw-cover type unless otherwise indicated or required by Code.

D. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Metal Floor Boxes:
1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: As required for installation of intended device.

L. Gangable boxes are allowed.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, **Type 1** with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:
1. NEMA 250, **Type 1** galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC unless otherwise required by utility service provider.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew, steel or cast-metal fittings. Compression style fitting are not allowed. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with requirements in Section 260500 "Common Work Results for Electrical" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC before rising above floor unless otherwise required by Code.

M. Stub-Ups to Above Recessed Ceilings:
1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

X. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Conduit extending from interior to exterior of building.
   4. Conduit extending into pressurized duct and equipment.
   5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
   6. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Z. Expansion-Joint Fittings:
   1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
   2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
      c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
   3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078

inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

AA. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

BB. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

EE. Locate boxes so that cover or plate will not span different building finishes.

FF. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

GG. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

HH. Set metal floor boxes level and flush with finished floor surface.

II. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 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 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
2. Rigid nonmetallic duct.
3. Flexible nonmetallic duct.
4. Duct accessories.
5. Precast concrete handholes.
6. Polymer concrete handholes and boxes with polymer concrete cover.
7. Fiberglass handholes and boxes.
8. Utility structure accessories.

1.3 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.

B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

C. Duct Bank:

1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

D. GRC: Galvanized rigid (steel) conduit.

E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including spacers and miscellaneous components.

2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes, and other utility structures.
4. Include underground-line warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design.
e. Include grounding details.
f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 FIELD CONDITIONS

A. Ground Water: Confirm ground water level with Architect and Civil Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. CONDUITS AND FITTINGS:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc.
b. Allied Tube & Conduit; a Tyco International Ltd. Co.
c. Carlon, by ABB.
d. O-Z/Gedney; a brand of EGS Electrical Group.
e. Prime Conduit, Inc.
f. Republic Conduit.
g. Southwire Company

h. Thomas & Betts Corporation.
i. Western Tube and Conduit Corporation.
j. Wheatland Tube Company; a division of John Maneely Company.

B. DUCT ACCESSORIES:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Allied Tube & Conduit; a Tyco International Ltd. Co.
b. Cantex, Inc.
c. Carlon, by ABB
d. Kraloy Fittings.

C. PRECAST CONCRETE HANDHOLES AND BOXES:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. H2 Pre-Cast Inc.
b. Oldcastle Infrastructure.

D. POLYMER CONCRETE AND FIBERGLASS HANDHOLES AND BOXES:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. MacLean Highline.
b. Oldcastle Infrastructure.
c. Quazite; Hubbell Incorporated.

2.2 METAL CONDUIT AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

B. Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.3 RIGID NONMETALLIC DUCT

A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

C. Solvents and Adhesives: As recommended by conduit manufacturer.

2.4 FLEXIBLE NONMETALLIC DUCTS

A. HDPE Duct: Type EPEC-40 HDPE, complying with NEMA TC 7 and UL 651A.
   1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.5 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.6 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

B. Comply with ASTM C858 for design and manufacturing processes.

C. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

E. Cover Legend: Molded lettering, "ELECTRIC."

F. Configuration: Units shall be designed for flush burial and have integral closed bottom unless otherwise indicated.

G. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

   1. Extension shall provide increased depth as required by utility service provider.
   2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

I. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
   1. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.

2. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
3. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
4. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.

J. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

C. Color: Gray or Green as per Architect.

D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

G. Cover Legend: Molded lettering, "ELECTRIC."

H. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.8 FIBERGLASS HANDHOLES AND BOXES

A. Description: Molded of fiberglass-reinforced polyester resin, with covers made of hot-dip galvanized-steel diamond plate.

B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

C. Color: Gray or Green as per Architect.

D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

G. Cover Legend: Molded lettering, "ELECTRIC" or “TELECOM” as applicable.

H. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.9 UTILITY STRUCTURE ACCESSORIES

A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

B. Provide per the requirements of each utility service provider. See utility service construction drawings and coordinate with the utility service providers.

2.10 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Cables More Than 600 V: Type EPC-40-PVC RNC, installed per Electrical Utility Company requirements.

B. Duct for Electrical Feeders 600 V and Less: Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.

C. Duct for Electrical Branch Circuits: Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.

D. Bored Underground Duct: Type EPEC-80-HDPE unless otherwise indicated.

E. Underground Ducts Crossing Driveways and Roadways: Type EPC-40 PVC RNC, encased in reinforced concrete.

F. Stub-ups: Concrete-encased GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete; confirm requirements with General Contractor.

C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct according to NEMA TCB 2.

C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.

D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm) for utility service ducts, both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct shall have maximum of three 90 degree bends or the total of all bends shall be no more 270 degrees between pull points.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell, without reducing duct slope and without forming a trap in the line.
2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

G. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to terminator spacing 10 feet (3 m) from the terminator, without reducing duct line slope and without forming a trap in the line.
2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line duct with calculated expansion of more than 3/4 inch (19 mm).

H. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition.

I. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

J. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.

K. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
3. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
4. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
7. Spacer Installation: Install spacers per Utility Service Provider requirements. Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
8. Maintain clearances required by utility service providers.
9. Elbows: Install per requirements of utility service providers.
10. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

L. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
1. Install handholes with bottom below frost line.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators**,** as required by the utility service providers

D. Field-Installed Bolting Anchors in Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as

indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-(300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
3. Test and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump.

1. Sweep floor, removing dirt and debris.
2. Remove foreign material.

END OF SECTION 260543

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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:
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:
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:
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:
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:
   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:
   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.
3. Write-on Tags:
4. Place in a location with high visibility and accessibility.
5. Secure using General purpose cable ties except where Code requires plenum rated cable ties.

Y. 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.

Z. 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.

AA. 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.

BB. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

CC. 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. "POWER."
3. "UPS."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wrapa-round 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. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchboards.
   e. Distribution boards.
   f. Current Transformer enclosure.
   g. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   h. Emergency system boxes and enclosures.
   i. Enclosed switches.
   j. Enclosed circuit breakers.
   k. Enclosed controllers.
   l. Variable-speed controllers.
   m. Push-button stations.
   n. Power-transfer equipment.
   o. Contactors.
   p. Remote-controlled switches and control devices.
   q. Battery-inverter units.
   r. Monitoring and control equipment.
   s. UPS equipment.
   t. Permanent Generator.
   u. Portable Generator Docking Station.

END OF SECTION 260553

SECTION 26 05 73

ELECTRICAL SYSTEMS STUDIES

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 computer-based, fault-current/ short-circuit, coordination and arc flash studies to determine the minimum interrupting capacity of circuit protective devices, the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment, and overcurrent protective devices.

1. Study results shall be used to determine coordination of devices for 701 power systems (Code Required Standby) per the requirements of Code and the local AHJ.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.

2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

a. Short-circuit and Arc-flash study input data, including completed computer program input data sheets.

b. Short-circuit and Arc-flash study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

2) Revised one-line diagram, reflecting field investigation results and results of short-circuit and arc-flash study.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

2. The following are from the Short-Circuit and Arc-flash Study Report:

a. Final one-line diagram.

b. Final Short-Circuit, Arc-flash and Coordination Study Report.

c. Power system data.

d. Coordination study data files.

e. List of all protective device settings.

f. Time-current coordination curves.

g. Power system data.

1.6 QUALITY ASSURANCE

A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.

2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Fault-Current / Short-Circuit, Arc-flash and Coordination Study Certification: Fault-Current / Short-Circuit, Coordination and Arc-flash Study Report shall be signed and sealed by an Electrical Engineer currently registered in the State of Washington.

PART 2 PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

B. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT/ FAULT-CURRENT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor designations and kVA ratings.
5. Switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.

5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    a. Voltage.
    b. Calculated fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Equivalent impedance.
2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:
        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.

c. Fault-point X/R ratio.

d. No AC Decrement (NACD) ratio.

e. Equivalent impedance.

f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

2.3 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor designations and kVA ratings.
5. Switchboard and panelboard designations.
6. Any revisions to electrical equipment required by the study.
7. Study Input Data: As described in "Power System Data" Article.

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
    a. Phase and Ground Relays.
        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.
    b. Circuit Breakers:

1) Adjustable pickups and time delays (long time, short time, and ground).

2) Adjustable time-current characteristic.

3) Adjustable instantaneous pickup.

4) Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.

2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

4. Plot the following listed characteristic curves, as applicable:

a. Power utility's overcurrent protective device.

b. Medium-voltage equipment overcurrent relays.

c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.

e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.

f. Cables and conductors damage curves.

g. Ground-fault protective devices.

h. Motor-starting characteristics and motor damage points.

i. Generator short-circuit decrement curve and generator damage point.

j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Maintain selectivity for tripping currents caused by overloads.

6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.

7. Provide adequate time margins between device characteristics such that selective operation is achieved.

8. Comments and recommendations for system improvements.

2.4 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.

2. Conductor types, sizes, and lengths.

3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.

4. Motor and generator designations and kVA ratings.

5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

a. Study Input Data: As described in "Power System Data" Article.

b. Arc-Flash Study Output Reports:

1) Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a) Voltage.

b) Calculated symmetrical fault-current magnitude and angle.

c) Fault-point X/R ratio.

d) No AC Decrement (NACD) ratio.

e) Equivalent impedance.

f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

D. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

E. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.5 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.
    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.
4. Arc flash PPE category.

5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate the required input data to support the short-circuit and arc-flash study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.

3.3 SHORT-CIRCUIT, COORDINATION AND ARC-FLASH STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-

switching configurations and alternate operations that could result in maximum fault conditions.

G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Include in the report identification of any protective device applied outside its capacity.

J. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.

b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.

c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

3.4 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

1. Calculate maximum and minimum contributions of fault-current size.

a. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

b. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.

c. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.

d. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

2. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

3. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

4. Calculate the limited, restricted, and prohibited approach boundaries for each location.

5. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

   a. Fault contribution from induction motors shall not be considered beyond three to five cycles.

   b. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

6. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

   a. When the circuit breaker is in a separate enclosure.

   b. When the line terminals of the circuit breaker are separate from the work location.

7. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.5 ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

3.6 LABELING

A. Apply arc-flash label on the front cover of each section of the equipment for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:

1. Low-voltage switchboard.
2. Panelboard and safety switch over 250 V.
3. Applicable panelboard and safety switch under 250 V.

C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel in the following:

1. Potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.
2. The fundamentals of operating the power system in normal and emergency modes.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Indoor occupancy and vacancy sensors.
   2. Digital timer light switches.
   3. Lighting contactors.
   4. Emergency shunt relays.

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 GENERAL REQUIREMENTS

A. All lighting control equipment and devices are to be hard-wired. Wireless devices are not allowed on the project.

2.2 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. 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 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.

2.3 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. 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. Eaton Lighting.
   3. Leviton Mfg. Company, Inc.
   4. Lutron.
   5. Wattstopper

B. Description: Complying with UL 924.

2.5 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.

B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections. Replace all defective lighting control devices and retest.

C. 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 Entry Vestibule 101A, the exterior wall grazers (Type W8) and the exterior uplights at the east entry (Type W9). Review of the exterior luminaires shall occur after sunset.

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

SECTION 26 24 16

PANELBOARDS

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.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of 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 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 panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For 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. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. 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.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Environmental Limitations:
1. Do not deliver or install 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 main-

taining 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 WARRANTY

A. 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.

PART 2 PRODUCTS

2.1 PANELBOARDS GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Corporation; Cutler-Hammer Products.
   2. GE by ABB, Electrification Products Division
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric USA, Inc.

B. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards 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 NEMA PB 1.

F. Comply with NFPA 70.

G. Enclosures: Surface-mounted, 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. 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.
   4. 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.

H. Incoming Mains:
1. Location: Per Contractor.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

I. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
a. 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.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

K. 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.

L. Panelboard Short-Circuit Current Rating: Series 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 or 10,000 A rms symmetrical, whichever is greater.
2. Panelboards 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.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards 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."

B. Surge Suppression Devices:
   1. Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.
   2. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
   3. Comply with UL 1283.
   4. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
      a. Line to Neutral: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
      b. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
      c. Neutral to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
      d. Line to Line: 2000 V for 480Y/277 V and 1200 V for 208Y/120 V.
   5. SCCR: Equal to the SCCR of the panelboard in which installed or exceed 100 kA.
   6. Inominal Rating: 20 kA**.**

2.3 POWER 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.

2.4 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.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. 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. 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.

2.6 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.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards 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 panelboards according to NECA 407

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of 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 panelboards and accessories according to NECA 407.

D. Equipment Mounting:
   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.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements as required by the local AHJ and Project Structural Engineer.

G. Mount such that the top-most circuit breaker is not higher than 79-inches above finished floor as required by Code.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount surface-mounted panelboards to steel slotted supports1 1/4 inch (32 mm) in depth. Orient steel slotted supports vertically.

J. Install overcurrent protective devices and controllers 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.

K. 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.

L. Install filler plates in unused spaces.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

A. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. 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. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Perform the following infrared scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:
        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

C. 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 panelboards included and that describes scanning results, with comparisons of

the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 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.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Standard-grade receptacles, 125 V, 20 A.
2. USB receptacles.
3. GFCI receptacles, 125 V, 20 A.
4. Twist-locking receptacles.
5. Pendant cord-connector devices.
6. Toggle switches, 120/277 V, 20 A.
7. Occupancy sensors.
8. Wall plates.
9. Floor service fittings.
10. Prefabricated multioutlet assemblies.

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. Leviton Mfg. Company, Inc.
   4. 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.

K. General Purpose Receptacles, Interior Locations:
   1. In all Dwelling Units, provide 125V, 15A, Tamper-Resistant 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.
   2. In Common areas of multifamily buildings, provide 125V, 20A, Tamper-Resistant 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.

3. 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.
4. 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.
5. Provide specialty type receptacles as required for appliances/ equipment and/ or as indicated on the drawings.

L. General Purpose Receptacles, Exterior Locations:
1. For all exterior areas of provide 125V, 20A, Tamper-Resistant, GFCI-type receptacles in weatherproof while in use enclosures unless otherwise required by Code, equipment to be connected, or the Contract Documents.
2. Provide specialty type receptacles as required for appliances/ equipment and/ or as indicated on the drawings.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. General Purpose Receptacles:
1. Provide 125 V, 20A general purpose receptacles.

B. 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 and FS W-C-596.

C. Tamper-Resistant Duplex Receptacles, 125 V, 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 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

D. Weather-Resistant Duplex Receptacle, 125 V, 20 A
1. Description: 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 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.3 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.

2.4 GFCI RECEPTACLES, 125 V, 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 5-20R.
   3. Type: Non-feed through.
   4. Standards: Comply with UL 498, UL 943 Class A.

B. Weather-Resistant, GFCI Duplex 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. Square face.
   2. Configuration: NEMA WD 6, Configuration 5-15R.
   3. Type: Non-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, 20 A
   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 5-20R.
   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, 20 A
   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 5-20R.
   3. Type: Non-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.

2.5 TWIST-LOCKING RECEPTACLES

A. Configuration: NEMA WD 6, See Power Plans for Configuration.

B. Standards: Comply with UL 498.

2.6 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 UL 498.

2.7 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.

2.8 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, and FS W-S-896.

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.

2.9 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.

2.10 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.

2.11 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.

2.12 FLOOR SERVICE FITTINGS

A. Manufacturers: Subject to compliance with requirements, for the following Sections provide products from one of the following:
1. Hubbell Incorporated.
2. Wiremold; Legrand North America, LLC.

B. See drawings for additional information and requirements.

C. Flush-Type Floor Service Fittings:
1. Description: Type: Modular, flush-type, dual-service units suitable for wiring method used, with cover flush with finished floor.
2. Compartments: Barrier separates power from voice and data communication cabling.
3. Service Plate and Cover: Rectangular die-cast aluminum with satin finish.
4. Power Receptacle: NEMA WD 6 Configuration 5-20R, colors to be project standards (normal, UPS receptacles to be different colors per Architect), unless otherwise indicated.
5. Data Communication Outlet: See preliminary low voltage systems drawings and confirm with Design-Build Low Voltage Contractor, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

D. Flap-Type Service Fittings:
1. Description: Type: Modular, flap-type, dual-service units suitable for wiring method used, with flaps flush with finished floor.
2. Compartments: Barrier separates power from voice and data communication cabling.
3. Flaps: Rectangular, die-cast aluminum with satin finish.
4. Service Plate: Same finish as flaps.
5. Power Receptacle: NEMA WD 6 Configuration 5-20R, colors to be project standards (normal, UPS receptacles to be different colors per Architect), unless otherwise indicated.
6. Data Communication Outlet: See preliminary low voltage systems drawings and confirm with Design-Build Low Voltage Contractor, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.13 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] [PVC].

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. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on botton. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through GFCI receptacles; 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 Equipment Room, 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 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.

END OF SECTION 262726

SECTION 26 28 13

FUSES AND ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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.

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. Inspect physical and mechanical condition.
      b. Inspect anchorage, alignment, grounding, and clearances.
      c. Verify that the unit is clean.
      d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
      e. Verify that fuse sizes and types match the Specifications and Drawings.
      f. Verify that each fuse has adequate mechanical support and contact integrity.
      g. Verify correct phase barrier installation.
      h. 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. Operate the circuit breaker to ensure smooth operation.
      f. 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

SECTION 263213

DIESEL ENGINE GENERATORS

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 packaged engine generators used to supply non-emergency power, with the following features:
   1. Diesel engine.
   2. Diesel fuel-oil system.
   3. Control and monitoring.
   4. Generator overcurrent and fault protection.
   5. Generator, exciter, and voltage regulator.
   6. Load banks.
   7. Outdoor engine generator enclosure.
   8. Remote radiator motors.
   9. Vibration isolation devices.
   10. Finishes.

B. Related Requirements:
   1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Include thermal damage curve for generator.
   3. Include time-current characteristic curves for generator protective device.
   4. Include fuel consumption in gallons per hour (liters per hour) at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
   5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

6. Include airflow requirements for cooling and combustion air in cubic feet per minute (cubic meters per minute) at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F (35, 27, 21, and 10 deg C). Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:
1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for engine generator, 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: With engine and generator mounted on rails, identify center of gravity and total weight, including full subbase-mounted fuel tank, supplied enclosure, external silencer and each piece of equipment not integral to the engine generator, 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.

B. Source Quality-Control Reports: Including, but not limited to, the following:
1. Report of sound generation.
2. Report of exhaust emissions showing compliance with applicable regulations.

C. Field quality-control reports.

D. Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators 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. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
      b. Operating instructions laminated and mounted adjacent to generator location.
      c. Training plan.

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. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
   2. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An factory-authorized service representative who is trained and approved by manufacturer.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to project requirements, provide equipment by one of the following.
   1. Generator to be provided from same manufacturer as the automatic transfer switch.
      a. Caterpillar, Inc.
      b. Generac Power Systems, Inc.
      c. Kohler Power Systems.
      d. MTU Onsite Energy.

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to Code, the local AHJ and the project structural engineer.
   1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Component Importance Factor: 1.5.

B. B11 Compliance: Comply with B11.19.

C. NFPA Compliance:
   1. Comply with NFPA 37.
   2. Comply with NFPA 70.

D. UL Compliance: Comply with UL 2200.

E. Engine Exhaust Emissions: Comply with EPA Tier 2 requirements and applicable state and local government requirements.

F. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

G. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: 5 to 104 deg F (Minus 15 to plus 40 deg C).
   2. Relative Humidity: Zero to 95 percent.
   3. Altitude: Sea level to 1000 feet (300 m).

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Power Factor: 0.8, lagging.

D. Frequency: 60 Hz.

E. Voltage: 480V ac.

F. Phase: Three-phase, four wire, wye.

G. Induction Method: Naturally aspirated.

H. Governor: Adjustable isochronous, with speed sensing.

I. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

J. Engine Generator Performance for Sensitive Loads:
1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
   a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
   a. Provide permanent magnet excitation for power source to voltage regulator.
10. Start Time: 10 seconds.

2.4 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499.

E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 23 feet (7 m) from exhaust discharge after installation is complete shall be 75.1 dBA or less at full load.

G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 24-V electric, with negative ground.
1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: 60 seconds.

4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length required. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:
    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F (minus 40 to plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 3R, cabinet installed in generator enclosure.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 231113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. In addition to the subbase-mounted fuel tank, a Fuel-Oil Storage Tank shall also be provided. See design drawings and Specification Section 22 29 00.
   1. Fuel Tank Capacity: See drawings and Specification Section 22 29 00.
   2. Duplex Fuel-Oil Transfer Pump: Comply with requirements in Section 22 29 00.
   3. Pumps and controls for the separate fuel-oil storage tank are to be provided by the fuel tank system provider. The Contractor and Generator factory authorized service representative shall coordinate on site with the fuel oil storage tank installer to install and connect complete the fuel oil tank system to the generator subbase tank.
   4. The generator shall accommodate fuel system return pump, solenoid valve, and other piping and equipment associated with the connection of the fuel oil tank with the generator's subbase tank per Code and manufacturer's instructions. See P11.02 and Specification Section 22 29 00 for basis of design requirements. Confirm exact equipment and connection requirements with fuel oil tank system designer and installer.

G. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
   1. Tank level indicator.
   2. Fuel-Tank Capacity: See design drawings.
   3. Leak detection in interstitial space.
   4. Vandal-resistant fill cap.
   5. Containment Provisions: Comply with requirements of authorities having jurisdiction.
   6. Subbase tank shall comply with current Fire Code requirements for exterior generator subbase fuel tanks per AHJ requirements.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Provide minimum run time control set for 30 minutes with override only by operation of a remote emergency-stop switch.

C. Comply with UL 508A.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

E. Control and Monitoring Panel:
   1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
   2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
   3. Instruments: Located on the control and monitoring panel and viewable during operation.
      a. Engine lubricating-oil pressure gage.
      b. Engine-coolant temperature gage.
      c. DC voltmeter (alternator battery charging).
      d. Running-time meter.
      e. AC voltmeter, [for each phase] [connected to a phase selector switch].
      f. AC ammeter, [for each phase] [connected to a phase selector switch].
      g. AC frequency meter.
      h. Generator-voltage adjusting rheostat.
   4. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
      a. Cranking control equipment.
      b. Run-Off-Auto switch.
      c. Control switch not in automatic position alarm.
      d. Overcrank alarm.
      e. Overcrank shutdown device.
      f. Low-water temperature alarm.
      g. High engine temperature pre-alarm.
      h. High engine temperature.
      i. High engine temperature shutdown device.
      j. Overspeed alarm.
      k. Overspeed shutdown device.
      l. Low fuel main tank.
         1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required in "Fuel Tank Capacity" Subparagraph in "Diesel Fuel-Oil System" Article.
      m. Coolant low-level alarm.
      n. Coolant low-level shutdown device.

o. Coolant high-temperature prealarm.
p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. Battery high-voltage alarm.
t. Low cranking voltage alarm.
u. Battery-charger malfunction alarm.
v. Battery low-voltage alarm.
w. Lamp test.
x. Contacts for local and remote common alarm.
y. Low-starting air pressure alarm.
z. Low-starting hydraulic pressure alarm.
aa. Remote manual stop shutdown device.
bb. Air shutdown damper alarm when used.
cc. Air shutdown damper shutdown device when used.
dd. Generator overcurrent-protective-device not-closed alarm.
ee. Hours of operation.
ff. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

F. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are flush-mounting type to suit mounting conditions indicated. See design drawings for location in Dispatch Room.
1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Generator overcurrent-protective-device not-closed alarm.

G. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   4. Mounting: Adjacent to, or integrated with, control and monitoring panel.

C. Generator Circuit Breaker: Insulated-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   4. Mounting: Adjacent to, or integrated with, control and monitoring panel. Install in a separate enclosure, not on the generator skid.

D. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
   1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
   2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
   3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
   4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six- or 12-lead alternator.

E. Range: Provide broad range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: NEMA 3R.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
   1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
   2. Maintain voltage within 15 percent on one step, full load.
   3. Provide anti-hunt provision to stabilize voltage.
   4. Maintain frequency within 15 percent and stabilize at rated frequency within 2 seconds.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing; wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
   1. Sound Attenuation Level: 2

B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph (160 km/h); confirm requirements with Code, the local AHJ and the Electrical Contractor’s structural engineer.

C. Seismic Design: Comply with seismic requirements in Section 260500.

D. Hinged Doors: With padlocking provisions.

E. Space Heater: Thermostatically controlled and sized to prevent condensation.

F. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

G. Muffler Location: Within enclosure.

H. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.
   1. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.

I. Interior Lights with Switch: Factory-wired, vaporproof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.
   1. AC lighting system and connection point for operation when remote source is available.
   2. DC lighting system for operation when remote source and generator are both unavailable.

J. Convenience Outlets: Factory-wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
   1. Material: Standard neoprene or Bridge-bearing neoprene, complying with AASHTO M 251 separated by steel shims.
   2. Number of Layers: As required.
   3. Minimum Deflection: 1 inch (25 mm).

B. Comply with requirements in Section 22 29 00 for vibration isolation and flexible connector materials for steel piping.

C. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 FINISHES

A. Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
   1. Tests: Comply with IEEE 115.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

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

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions.

C. Equipment Mounting:
   1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Division 03.
   2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
   1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
   2. Install flexible connectors and steel piping materials according to requirements in Section 232116 "Hydronic Piping Specialties."
   3. Insulate muffler/silencer and exhaust system components according to requirements in Section 230719 "HVAC Piping Insulation."

F. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.
   1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
   2. Drain piping valves, connectors, and installation requirements are specified in Section 232116 "Hydronic Piping Specialties."

G. Fuel Piping:
   1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems are specified in Section 231113 "Facility Fuel-Oil Piping."
   2. Copper and galvanized steel shall not be used in the fuel-oil piping system.

H. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.

C. See Specification Section 22 29 00.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems" and the design drawings.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

F. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.4 IDENTIFICATION

A. Identify system components according to Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating that, “"BOND REFERENCE FOR PORTABLE GENERATOR IS THE PERMANENTLY-INSTALLED GENERATOR BOND. DO NOT DISCONNECT PERMANENT GENERATOR OR NEUTRAL BOND AT PERMANENT GENERATOR."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative].

C. Tests and Inspections:
1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
   a. Visual and Mechanical Inspection:
      1) Compare equipment nameplate data with Drawings and the Specifications.
      2) Inspect physical and mechanical condition.
      3) Inspect anchorage, alignment, and grounding.
      4) Verify that the unit is clean.
   b. Electrical and Mechanical Tests:
      1) Perform insulation-resistance tests according to IEEE 43.
         a) Machines Larger Than 200 hp (150 kW): Test duration shall be 10 minutes. Calculate polarization index.
         b) Machines 200 hp (150 kW) or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.
      2) Test protective relay devices.
      3) Verify phase rotation, phasing, and synchronized operation as required by the application.
      4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
      5) Verify correct functioning of the governor and regulator.
2. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.
3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

4. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
5. Exhaust Emissions Test: Comply with applicable government test criteria.
6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
7. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
8. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at three locations; 25 feet (8 m) from edge of the generator enclosure, on the east property line and on the north property line, and compare measured levels with required values.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest as specified above.

J. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

L. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 COMMISSIONING

A. Engage a factory-authorized service representative to perform tests and activities indicated.

B. Revise "Monitoring and Testing Schedule" Paragraph below to specify extent and basic schedule for performance testing required for Project. Schedule below provides opportunity to specify single or multiple monitoring periods.

C. Monitoring and Testing Schedule:
1. Schedule monitoring and testing activity with Owner, through Architect, with at least 14 days' advance notice.

D. The Project shall be commissioned per Owner requirements. The Contractor shall coordinate with the General Contractor, Architect and Commissioning Agent and provide support for the complete commissioning process as required. See Division 01 Section 01 91 13 and individual Specifications Sections in Divisions 26, 27 and 28 for additional information, roles and responsibilities of commissioning.

E. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

F. Provide completed start-up forms and checklists to the Engineer and Commissioning Agent for the Generator and ATS System.

G. 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.

H. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

I. Coordinate final adjustment, testing and commissioning of electrical, low voltage, and fire alarm systems with the General Contractor, Owner, Architect, Engineer and, as required, the Fire Authority. These include but are not limited to the following. See individual specification sections for detailed requirements. Provide factory-authorized service representatives where required in Specification Sections. The Owner’s Representative, Architect and Commissioning Agent shall be present at all tests unless they indicate otherwise in writing.
1. Permanent Generator System, Automatic Transfer Switch and remote fuel tank fuel transfer system: Among other requirements as per Specifi-

cation Sections 26 32 13 and 26 36 00, testing shall include at least 8 consecutive hours of generator runtime. Coordinate with General Contractor, Commissioning Agent and remote fuel tank system installer.

2. Portable Generator Docking Station: Among other requirements as per Specification Section 26 32 13, testing shall include the Contractor providing a portable generator of the same size as the permanently installed generator, connecting it to the portable generator docking station, and running the portable generator for at least 4 hours.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

B. Coordinate this training with that for automatic transfer switch, remote fuel fill system, portable generator docking station.

END OF SECTION 263213

SECTION 263600

TRANSFER SWITCHES

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 automatic and nonautomatic transfer switches rated 600 V and less, including the following:
   1. Bypass/isolation switches.
   2. Remote annunciator system.
   3. Remote annunciator and control system.
   4. Portable generator docking station.

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 transfer switches.
   2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
   2. Include material lists for each switch specified.
   3. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for transfer switches, docking stations, 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.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product 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. Features and operating sequences, both automatic and manual.
      b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL PERFORMANCE 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. Comply with NEMA ICS 1.

C. Comply with UL 1008 unless requirements of these Specifications are stricter.

D. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

E. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
   1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
   2. Short-time withstand capability for three cycles.

F. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

G. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."
   1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
   2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
   3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
   4. Accessible via front access.

I. AUTOMATIC TRANSFER SWITCH
   1. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.
   2. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.
   3. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.
   4. Neutral Terminal: Solid and fully rated unless otherwise indicated.
   5. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. PORTABLE GENERATOR DOCKING STATION
   1. UL 50 listed.
   2. Enclosures General-purpose NEMA 250, Type 3R complying with NEMA ICS 6 and UL 508, unless otherwise indicated.
   3. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.
   4. Battery Charger Receptacle: For generator starting batteries.
      a. 20A, 125V, GFCI-type

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to project requirements, provide equipment by one of the following.
   1. ATS to be provided from same manufacturer as the permanent generator.
      a. ASCO.
      b. Caterpillar, Inc.
      c. Generac Power Systems, Inc.
      d. Kohler Power Systems.

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Mechanical type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
   1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

F. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

G. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

H. Automatic Transfer-Switch Controller Features:
   1. Controller operates through a period of loss of control power.
   2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
   3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
   4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
   5. Test Switch: Simulate normal-source failure.
   6. Switch-Position Pilot Lights: Indicate source to which load is connected.
   7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
      a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: Coordinate with generator. Provide one isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum as required.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

I. Large-Motor-Load Power Transfer:
1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.
3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

J. TRANSFER SWITCH ACESSORIES
1. Bypass/Isolation Switches:
a. Source Limitations: Same manufacturer as transfer switch in which installed.
b. Comply with requirements for Level 1 equipment according to NFPA 110.
c. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:
1) Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. Interlocks shall prevent transfer-switch operation, except for testing or maintenance, while automatic transfer switch is isolated.
2) Provide means to make power available to transfer-switch control circuit for testing and maintenance purposes.
3) Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations. Transfer switch and bypass/isolation switch shall be in isolated compartments.
4) Transition: Provide closed-transition operation when transferring from main transfer switch to bypass/isolation switch on the same power source.
5) Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
6) Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
7) Automatic and Nonautomatic Control: Automatic transfer-switch controller shall also control the bypass/isolation switch.
8) Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
9) Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.
d. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.
2. Remote Annunciator System:
a. Source Limitations: Same manufacturer as generator and transfer switch in which installed.
b. Functional Description: Remote annunciator panel shall annunciate conditions for transfer switch and permanent generator.

c. See Generator Specification Section for additional information and requirements.

2.3 PORTABLE GENERATOR DOCKING STATION

A. Manufacturer: Provide equipment by Trystar. No exceptions.

B. Standard Features:

C. 65kAIC Rated.

D. Bottom Hinged Door Will Not Open Unless Main Door Has Been Opened

E. Enclosure: All Aluminum Construction; Powder Coat Color: Hammer Gray. NEMA 3R.

F. Silver Plated Copper Busbar

G. Clear Flip Covers on All Panel Mounts to Prevent Accidental Contact

H. Padlockable Swinging Front Door

I. Trystar Rake Theft Reduction System

J. Phase Rotation Monitor

K. Tabs on Rear for Mounting to Wall

L. Bottom Conduit Access

M. Permanent Generator Connections:
1. 3-pole circuit breaker; see drawings for rating.
2. Kirk-key interlocked.
3. NO/NC auxiliary contacts.
4. Four (4) 600 MCM mechanical lug terminations per Phase, Neutral and Ground for permanent connection to Line.

N. Temporary Generator Connections:
1. 3-pole circuit breaker; see drawings for rating.
2. Kirk-key interlocked.
3. Three (3) sets of Male 16 Series Panel Mounts
   a. Brown, Orange, and Yellow Panel Mounts for Phases, White Panel Mounts for Neutral.
4. One (1) Male Green 16 Series Ground Panel Mount.

O. Permanent Load Connections:
1. Four (4) 600 MCM mechanical lug terminations per Phase, Neutral and Ground for permanent connection to Line.

P. DOCKING STATION OPTIONS AND ACCESSORIES:
1. Two Wire Auto Start.
2. Battery Charger Receptacle 20A GFCI 125V.

3. Block Heater Receptacle 30A L5-30 125V.
4. Kirk Key Interlocked Breakers.
5. Strip Heater & Thermostat.
6. NO/NC Aux Contacts on Main Breaker.

PART 3 EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.
   1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 03.
   2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
   3. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
   4. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, motor controls, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
   1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

F. Route and brace conductors according to manufacturer's written instructions and Section 26 05 00. Do not obscure manufacturer's markings and labels.

G. Brace and support equipment according to Section 26 05 00.

H. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches (457 mm) in length.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage factory-authorized service representatives to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of factory-authorized service representatives:
1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:
a. Compare equipment nameplate data with Drawings and Specifications.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and required clearances.
d. Verify that the unit is clean.
e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
f. Verify that manual transfer warnings are attached and visible.
g. Verify tightness of all control connections.
h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
1) Use of low-resistance ohmmeter.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
i. Perform manual transfer operation.
j. Verify positive mechanical interlocking between normal and alternate sources.
k. Perform visual and mechanical inspection of surge arresters.
l. Inspect control power transformers.
1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
a. Perform insulation-resistance tests on all control wiring with respect to ground.

b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
c. Verify settings and operation of control devices.
d. Calibrate and set all relays and timers.
e. Verify phase rotation, phasing, and synchronized operation.
f. Perform automatic transfer tests.
g. Verify correct operation and timing of the following functions:
1) Normal source voltage-sensing and frequency-sensing relays.
2) Engine start sequence.
3) Time delay on transfer.
4) Alternative source voltage-sensing and frequency-sensing relays.
5) Automatic transfer operation.
6) Interlocks and limit switch function.
7) Time delay and retransfer on normal power restoration.
8) Engine cool-down and shutdown feature.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
b. Verify time-delay settings.
c. Verify pickup and dropout voltages by data readout or inspection of control settings.
d. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

C. Coordinate tests with tests of generator, and portable generator docking station and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Transfer switch and docking station will be considered defective if they do not pass tests and inspections.

F. Remove and replace malfunctioning units and retest as specified above.

G. Prepare test and inspection reports.

H. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
   1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   2. 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.
   3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 COMMISSIONING

A. Engage a factory-authorized service representative to perform tests and activities indicated.

B. Monitoring and Testing Schedule:
   1. Schedule monitoring and testing activity with Owner, through Architect, with at least 14 days' advance notice.
   2. Schedule monitoring and testing when the UPS is supplying power to its intended load.

C. The Project shall be commissioned per Owner requirements. The Contractor shall coordinate with the General Contractor, Architect and Commissioning Agent and provide support for the complete commissioning process as required. See Division 01 Section 01 91 13 and individual Specifications Sections in Divisions 26, 27 and 28 for additional information, roles and responsibilities of commissioning.

D. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

E. Provide completed start-up forms and checklists to the Engineer and Commissioning Agent for the UPS System.

F. 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.

G. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

H. Coordinate final adjustment, testing and commissioning of electrical, low voltage, and fire alarm systems with the General Contractor, Owner, Architect, Engineer and, as required, the Fire Authority. These include but are not limited to the fol-

lowing. See individual specification sections for detailed requirements. Provide factory-authorized service representatives where required in Specification Sections. The Owner's Representative, Architect and Commissioning Agent shall be present at all tests unless they indicate otherwise in writing.

1. Permanent Generator System, Automatic Transfer Switch and remote fuel tank fuel transfer system: Among other requirements as per Specification Sections 26 32 13 and 26 36 00, testing shall include at least 8 consecutive hours of generator runtime. Coordinate with General Contractor, Commissioning Agent and remote fuel tank system installer.
2. Portable Generator Docking Station: Among other requirements as per Specification Section 26 32 13, testing shall include the Contractor providing a portable generator of the same size as the permanently installed generator, connecting it to the portable generator docking station, and running the portable generator for at least 4 hours.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Coordinate this training with that for generator equipment, and portable generator docking station.

END OF SECTION 263600

SECTION 26 51 19

INTERIOR AND EXTERIOR LIGHTING

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 interior and exterior luminaires, exit signs, emergency lighting units, and 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 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

C. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.

D. Warranty Period for Color Retention: Five years from date of Substantial Completion

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.

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 following:
1. Chloride by Signify.
2. Power Sentry, Acuity Brands.
3. Myers Emergency Power Systems.
4. 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 calculcations.

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, 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. 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."

B. 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."

C. 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.

D. 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.

1. 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 set for additional information and requirements.

E. 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

SECTION 27 00 00

LOW VOLTAGE SYSTEMS GENERAL CONDITIONS

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. Design Intent: Provide alterations and additions to the existing low voltage system for a renovation to the existing fire station in Machias WA. Low Voltage Systems to include but not limited to: alterations to existing telecom and CATV devices, addition of new devices in altered areas, and revisions to existing Alerting System.

B. All 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. The Design-Build Contractors shall design and provide complete and fully operational and coordinated Fire Alarm and Low Voltage systems that meet all requirements of the Owner, Fire Marshal/ local AHJ and as per the Project Contract Documents.
   1. Fire Alarm and Low Voltage Systems: The Following Systems are to be included in the Project:
      a. Telecommunications systems.
      b. Station Alerting System.
      c. Fire Alarm System.
   2. Fire Alarm System:
      a. Fire Alarm Systems shall be Design-Build. See Specification Sections 28 46 00, 28 46 21 and the Contract Drawings for system performance requirements for bidding by the Fire Alarm Design-Build Contractor.
   3. See Specification Section 26 00 00 for additional information and requirements.

C. 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.

D. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

1.3 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 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 Telecom and CATV devices and wiring extended from the existing systems for the project. Coordinate exact requirements, locations and device types with the Owner.
3. The Design-Build Contractor shall coordinate with the Owner to confirm telecom and CATV system device/cabling requirements prior to the start of design.
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 CATV system shall consist of cable television service and a coaxial cable distribution system.
   a. 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.
   b. 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.

D. ALERTING SYSTEM
1. The Design-Build Contractor shall survey the existing alerting system and provide extension of the system to connect to new devices within the modified station layout as required by the owner.

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. / Washington Cities Electrical Code.
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.

1.5 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. The Design-Build Contractor shall submit drawings and diagrams for review and for job coordination (see Section 26 00 00 for Power/ Lighting system requirements):
   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) Equipment Schedules.
         3) Low Voltage Systems (Telecom, CATV, access control, etc) floor plan drawings.
         4) Low Voltage Systems riser diagrams.

1.8 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Divisions 27 and 28 Specification Sections 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 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.

1.9 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. As requested in subsequent Division 27 and 28 Specification Sections.
3. For all special or custom-built items or equipment.
4. 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.

1.10 COMMISSIONING

A. See Division 01 and Sections 26 08 00 and 27 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 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.

1.11 PERMITS

A. See Specification Section 28 46 00 for Fire Alarm Systems Permit requirements.

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. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

L. Coordinate wall openings, rough-in locations, concrete housekeeping pads, and conduit rough-in locations to accommodate Work of Divisions 26, 27 and 28.

M. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

N. 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.

O. 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.

P. 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.

Q. 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.

R. 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 hours
   b. 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. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.22 TESTING

A. Provide completed start-up forms and checklists.

B. Perform testing of lighting control, non-utility metering, 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.

1.23 COMMISSIONING REPORT

A. Submit three (3) copies of the preliminary commissioning report as required by the Washington State, as outlined on drawing commissioning notes and specifications. This report is an execution and fulfillment of the commissioning plan. This report shall be completed before the final electrical permit inspection. At a minimum this report shall include:
1. Testing reports for systems required to be commissioned.
2. Complete system startup checklists.
3. Functional test reports.
4. Sequence of Operation test reports.
5. O&M Materials.
6. Record Drawings.
7. Owner training documentation.
8. Notes of any discrepancies observed during testing and any corrective actions taken or date when corrective action will be taken.
9. Notes of any tests which could not be performed due to weather conditions or other conflicts (identify specific conflict that prevented testing from occurring).

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.

1.24 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 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 Contractor will revise and/or prepare drawings for submittal.

3.2 MOCK-UPS

A. The Contractor shall completely mock-up areas as chosen by the Architect and Owner) by marking the intended locations of all equipment and devices (CATV and telecom outlets, CCTV camera locations, 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 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.

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

SECTION 28 46 00

FIRE ALARM GENERAL CONDITIONS

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: Provide alterations and additions to the existing Fire Alarm system for a renovation to the existing fire station in Machias WA. Fire Alarm Systems to include but not limited to: alterations of existing devices and addition of new devices in altered areas in the station as required by code.

B. All Fire Alarm 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, Architect and Owner prior to the start of construction. The Fire Alarm Contractor shall design and provide Fire Alarm systems (per Item #1 below) that meet all requirements of the Owner, Fire Marshal/ local AHJ and as per the Project Contract Documents.
   1. Fire Alarm System:
      a. Fire Alarm Systems shall be Design-Build. 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.
      b. The Fire Alarm Design-Build Contractor shall be a subcontractor to the Electrical Contractor.
      c. The Fire Alarm Design-Build Contractor shall design and provide complete and fully operational systems meeting the requirements of Code, the local Authority Having Jurisdiction (AHJ), local Fire Marshal, and as indicated in the Contract Documents.
      d. The Fire Alarm Contractor is responsible for providing all equipment, devices, parts and pieces required for complete and fully operational systems accepted by the Fire Marshal / Authority Having Jurisdiction.
      e. 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 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.

C. The Contractor shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of fire alarm work ready to operate in strict accordance with Code requirements and these specifications and drawings.

D. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

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 Cities Electrical Code.
3. Washington State Energy Code with Local Amendments.
4. International Fire Code (IFC) with Local Amendments.
5. International Building Code (IBC) with Local Amendments.
6. International Mechanical Code (IMC) with Local Amendments.
7. Uniform Plumbing Code (UPC) with Local Amendments.
8. The Americans with Disabilities Act (ADA).
9. Illuminating Engineering Society of North America (IESNA) Standards and Recommended Practices.
10. National Fire Protection Association (NFPA) Standards and Recommended Practices.
11. 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.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, FM, and UL for fire resistance ratings and surface burning characteristics.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Division 28 Specifications and on drawings are those upon which the fire alarm 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.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of 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.

1.7 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 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.

1.8 COMMISSIONING

A. See Division 01 and Sections 26 08 00 and 27 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 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.

1.9 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 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.

1.10 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.

1.11 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 included in Specification Sections 28 46 00 and 28 46 21 on projects of similar type and scale with a minimum of three years' experience.

1.12 SCHEDULING

A. Coordinate with and provide assistance in final adjustment and testing of life safety systems with the General Contractor and Fire Authority.

1.13 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.

1.14 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. 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.

1.15 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.

1.16 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. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

L. Coordinate wall openings, rough-in locations, and conduit rough-in locations to accommodate Work of Specification Sections 28 46 00 and 28 46 21.

M. Coordinate all equipment with building control work.

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. Prior to the start of Construction, coordinate locations and connection requirements for all line voltage power connections with the Electrical Contractor and Engineer.

1.17 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 and Specification Section 28 46 21 for additional requirements for the fire alarm system.

C. See other Divisions 26, 27 and 28 Specification Sections for complete project requirements.

1.18 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 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

1.19 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.

1.20 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.

1.21 TESTING

A. Provide completed start-up forms and checklists.

B. Perform testing of fire alarm systems as described in Specification Sections 28 46 00 and 28 46 21 and as required by applicable codes and ordinances.

C. Provide commissioning in compliance with the applicable Energy Code, the commissioning notes in the contract documents and per the Project's Commissioning Plan. Written verification of test to be signed by Owner's Representative.

1.22 COMMISSIONING REPORT

A. Submit three (3) copies of the preliminary commissioning report as required by the Washington State, as outlined on drawing commissioning notes and specifications. This report is an execution and fulfillment of the commissioning plan. This report shall be completed before the final electrical permit inspection. At a minimum this report shall include:
   1. Testing reports for systems required to be commissioned.
   2. Complete system startup checklists.
   3. Functional test reports.
   4. Sequence of Operation test reports.
   5. O&M Materials.
   6. Record Drawings.
   7. Owner training documentation.
   8. Notes of any discrepancies observed during testing and any corrective actions taken or date when corrective action will be taken.
   9. Notes of any tests which could not be performed due to conflicts (identify specific conflict that prevented testing from occurring).

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.

1.23 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 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 Fire Alarm Contractor will revise and/or prepare drawings for submittal.

3.2 MOCK-UPS

A. The Contractor shall completely mock-up areas as chosen by the Architect and Owner) 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 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.

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.

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.

3.5 FIELD QUALITY CONTROL

A. Conducts tests of equipment, devices, and systems as required by NFPA, local Codes and the local AHJ.
   1. Provide a Manufacturer’s 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 Division 01 and Specification Section 28 46 21 for additional Fire Alarm systems requirements.

C. Refer to other Divisions 26, 27 and 28 Specification Sections for complete project 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.

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 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.

3.8 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

SECTION 31 1000
SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Removing existing trees, shrubs, groundcovers plants and grass.
   2. Clearing and grubbing.
   3. Removing above- and below-grade site improvements including but not limited to fencing, gates, gravel drives and walkways, pavements, signage, structures and other appurtenances.
   4. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities where indicated.
   5. Temporary erosion and sedimentation control measures.
   6. Alleviation or prevention of dust nuisance.

B. Related Sections include the following:
   1. Division 01 Section "Execution and Closeout Requirements" for verifying utility locations and for recording field measurements.
   2. Division 01 Section on "Temporary Facilities and Controls" for protecting trees remaining on-site that are affected by site operations.
   3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
   4. Drawings and Sections 1-07, 2-01 and 2-02 of the WSDOT 2023 Standard Specifications for Road, Bridge, and Municipal Construction, Amendments and Special Provisions (WSDOT Special Provisions).

1.02 DEFINITION

A. Clearing is defined as removal of debris, brush, shrubs, vines, sod, and other vegetative growth at or above the ground surface.

B. Grubbing is defined as removal of vegetative growth or natural wooden items at or below ground surface, which remain after clearing work.

C. Tree Removal: Removal of trees, including stumps.

D. Demolition is defined as removal of fences, portion of structures, pavements, utilities, and other such manmade items at or below the ground surface. Salvage and deliver to Owner items noted in plans or as directed by Owner's Representative.

E. Disposal is defined as removal of refuse resulting from clearing, grubbing, and demolition work.

F. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

G. Tree: Persistent woody vegetation over 15 feet in height.

H. Brush: Persistent woody vegetation 15 feet or less in height.

1.03 OWNERSHIP OF MATERIALS

A. Unless otherwise shown, specified, or designated for salvage, all materials resulting from the grubbing, clearing and demolition work shall become the property of the Contractor and shall be disposed of off-site in a lawful manner.

1.04 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.05 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
3. Provide flaggers as needed to ensure public safety.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the Owner's premises where indicated.

C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

2.02 WATER

A. If temporary water meter is required, Contractor is responsible for this expense at no additional cost to the Owner.

B. Water used in dust control shall be free of silts and other materials deleterious to the quality of the material to which it is applied or with which it is mixed.

C. Unless otherwise specified in the Special Provisions, make all necessary arrangements for obtaining water and pay all costs involved in its procurement. Provide and maintain equipment necessary to pump, haul and place the water. Maintain an adequate supply of water at all times.

2.03 MISCELLANEOUS PRODUCTS

A. Herbicide: Round-Up Pro or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION OF SITE

A. Prior to commencement of Work under this section, the Owner's Representatives shall inspect the site to fully determine the extent of work requirements and limitations.

3.02 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated. Do not use paint to mark trees to remain.

C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to the Owner or Owner's Representative at no additional cost to the Owner.
2. Install and maintain tree protection barriers.

3.03 UTILITIES

A. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Call Utilities Underground Location Center (800) 424-5555, and the Engineer.

B. Contractor shall be responsible for determining which utility agencies, public or private, have underground or surface facilities. Locate and identify, with visible markings, existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations. Repair of damage to known utilities resulting from Work under this section shall be the responsibility of Contractor.

C. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed on the Drawings. Disconnect existing service lines to be abandoned and cap exposed service lines to be maintained.
1. Arrange with utility companies to shut off indicated utilities.

D. Consult the utility owner immediately for directions if uncharted piping or other utilities are encountered during excavation. Cooperate with the owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner. The cost of repairing charted utilities shall be paid by the contractor.

E. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner's Representative not less than 2 days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without written permission of the Owner's Representative and then only after acceptable temporary utility services have been provided.
   3. Refer to WSDOT Amendments and Special Provisions Section 1-07 for a list of utility owner contact information.

3.04 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Grind stumps and remove roots larger than one inch in diameter, obstructions, and debris extending to a depth of 24 inches below exposed subgrade.
   4. Use only hand methods for grubbing within tree protection zone.
   5. Chip removed tree branches and stockpile or spread onto areas approved by Owner's Representative.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.05 SOIL PREPARATION

A. Apply Roundup Pro to existing sod and grass areas per the manufacturer's recommendations. Tillage should be delayed for 7 days after application to allow for translocation into underground plant parts. Contractor to ensure grass has been killed prior to tilling activities and multiple applications might be required.

B. Till in dead sod and grass areas to an 8" depth. Till sod, grass and root systems into the existing soil until there is an even texture and the organics are fully incorporated into the soil.

C. Do not apply Roundup Pro or till soil under drip lines of existing trees to remain. Do not apply Round Up Pro in the wetland and habitat areas. Maintain a 200' no spray zone along the identified wetland boundary. Coordinate with the Owner prior to spraying.

3.06 SITE IMPROVEMENTS DEMOLITION

A. Remove existing above- and below-grade improvements as indicated on the Drawings and as necessary to facilitate new construction.

B. Remove paving, curbs, gravel driveways, gutters, and aggregate base as indicated on the Drawings.

C. Remove all debris from demolition work from the site as specified in this section.
   1. The removal of debris, construction materials, loose rocks and other materials at or below grade encountered while grading is considered incidental to the site preparation work.

3.07 DISPOSAL OF WASTE MATERIAL

A. All debris, rubbish and other waste materials removed under this section shall be removed from the site and disposed of in a lawful manner at Contractor's expense.
   1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

3.08 DUST CONTROL

A. Contractor shall provide a dust control media, such as water, to control on-site dust and to prevent dust from leaving the site. Failure may result in Owner providing dust control measures at Contractor's expense.

B. Watering shall be performed at any hour of the day and on any day of the week that the Owner's Representative may determine necessary for adequate alleviation of dust nuisance. Wastage of water or watering which is detrimental to other Work shall be avoided and such operations ceased until the Owner's Representative determines what corrective measures shall be taken.

C. Watering shall be by means of tank trucks equipped with spray bars, by hose and nozzle or by other means, any and all of which shall insure uniform and controlled application.

3.09 BACKFILLING AND CLEAN-UP

A. Leave the work site in a clean and slightly condition, free from litter and debris.

END OF SECTION

SECTION 31 2000
EARTH MOVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Site excavation and embankment.
   2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
   3. Excavating, stockpiling, and placement of topsoil
   4. Excavating and backfilling for buildings and structures.
   5. Drainage course for concrete slabs-on-grade.
   6. Base course for concrete walks and pavements.
   7. Excavating and backfilling for utility trenches.

B. Related sections include the following:
   1. Division 31 Section “Site Clearing”
   2. Drawings and Sections 2-03, 2-06, 4-04 and 9-03 of the WSDOT 2023 Standard Specifications for Road, Bridge, and Municipal Construction, Amendments and Special Provisions (WSDOT Standard Specifications).

1.02 DEFINITIONS

A. WSDOT: Washington Department of Transportation.

B. WSDOT "Standard Specifications for Road, Bridge, and Municipal Construction 2023,” hereby known as the Standard Specifications.

C. Base Course: Aggregate layer placed between the subgrade and hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

D. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. Drainage Course: Approved aggregate layer supporting the slab.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as replacement backfill, and remedial work directed by Engineer, shall be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.03 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.
   1. Conference shall be held 1 week prior to ground disturbing activities.
   2. Contractor, earthwork subcontractor, Engineer, and Owner’s Representative shall attend.
   3. Contractor shall provide estimated timeline of earthwork efforts, source of import material, plan for stockpiling and material storage (if necessary), and assurance that all erosion control devices and temporary tree and plant protection measures are in place prior to work.

1.04 PROJECT CONDITIONS

A. Utility Locator Service: Utility locates shall be performed prior to starting earth moving activities.

B. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Facilities and Controls" and erosion control BMPs are in place.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations or as noted in the plans.

B. Satisfactory Soils: Moisture conditioned native soils and as approved by the Engineer.

C. Unsatisfactory Soils: Soil as rejected by the Engineer

D. Base Course: Crushed Surfacing Base Course, meeting the requirements in Section 9-03.9(3) of the WSDOT Standard Specifications.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding Course: Gravel Backfill for Pipe Zone Bedding, meeting the requirements in Section 9-03.12(3) of the WSDOT Standard Specifications.

G. Drainage Course: Gravel Backfill for Drains, meeting the requirements in Section 9-03.12(4) of the WSDOT Standard Specifications.

H. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

2.02 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

B. Tracer Wire: All non-metallic pipe shall be installed with #14 copper tracer wire containing a metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when buried up to 60 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost.

D. Remove temporary protection before placing subsequent materials.

3.02 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to subgrade and obtain the Engineers approval of the subgrade.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
   1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.03 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.04 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, elevations, per Drawings and the WSDOT Standard Specifications, Amendments and Special Provisions.

B. Trenches in Tree- and Plant-Protection Zones:
   1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
   3. Cut and protect roots according to requirements in Division 01 Section "Temporary Facilities and Controls."

3.05 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.06 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by the Engineer.
   1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by the Engineer.
   2. Unauthorized excavation replacement shall be at the Contractors expense and the Engineers direction.

3.07 STORAGE OF SOIL MATERIALS

A. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.08 UTILITY TRENCH BACKFILL

A. Place bedding on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill remainder of trench with concrete to elevation of bottom of footings.

D. Trenches under Roadways: Use materials as indicated. For less than 30-inches of cover, ductile iron or C-900 pipe is required. A minimum of 18-inches of cover is required.

E. Place and compact bedding, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
   1. Carefully compact initial bedding under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage

or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Wrap all non-metallic pipe with #14 copper tracer wire prior to backfill.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.09 SOIL FILL

A. Terrace material per WSDOT Standard Specifications Section 2-03.3(14). Terraces shall also penetrate the slope at least 5-feet and shall not be more than 2-feet high.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use satisfactory soil material.
4. Under building slabs, use satisfactory soil material.
5. Under footings and foundations, use satisfactory soil material.

3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

B. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

C. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, compact existing subgrade and each layer of backfill or fill soil material at geotechnical recommended compaction.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent if not under a drivable surface.

3.12 TOPSOIL PLACEMENT

A. Prior to placement of topsoil, scarify subsurface to receive new topsoil.

B. Irrigated lawn and shrub areas to receive 2” imported topsoil.

C. Imported topsoil to be placed as required to achieve finish grades.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 BASE COURSES UNDER IMPERVIOUS PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:

1. Shape base course to required crown elevations and cross-slope grades.
2. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

C. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 FIELD QUALITY CONTROL

A. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

B. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by the Owner's representative.

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

D. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION

SECTION 31 2319
DEWATERING

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 construction dewatering.

B. Related Requirements:

1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is incorporated by reference and will be made available.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
   1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
   2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
   3. Prevent surface water from entering excavations by grading, dikes, or other means.
   4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
   5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
   1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
   2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 312500 "Erosion and Sediment Control" during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
   1. Space well points or wells at intervals required to provide sufficient dewatering.
   2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
   3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
   1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
   2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
   3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 31 2500
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Installation of slope protection and erosion control measures as shown on the Drawings, and as specified herein for the following:
   1. Temporary Construction Fencing
   2. Erosion Control Blanket (Jute Netting)
   3. Gravel Construction Entrance
   4. Plastic Sheeting
   5. Silt Fencing
   6. Straw Wattles
   7. Temporary Storm Inlet Protection

B. Related Sections include the following:
   1. Division 31 Section "Earthwork" for excavation, filling and backfilling, and grading.
   2. Division 32 Section “Turf and Grasses” for erosion control seed mixes.

1.2 DEFINITIONS

A. Temporary: Erosion and sediment control measures to be removed after completion of the project and after Owner's Representative or governing agency issues notification of acceptance of stabilization.

B. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.3 DESIGN REQUIREMENTS

A. Erosion and Sediment Control Plan: Refer to the Drawings and to *Stormwater Pollution Prevention Plan (SWPPP) for Snohomish Regional Fire & Rescue, Station 83.* The Drawings and SWPPP shall not relieve Contractor of responsibility for effective erosion and sediment control throughout the Project Site.

B. Soil Stabilization and Slope Protection: Required on slopes of 33 percent (three to one) gradient and steeper and where aggregate elevation change is 10 feet or more. Prevent soil loss to wind, water, and traffic and control growth of unwanted vegetation; provide rice or wheat straw or other acceptable soil cover.

C. Fill and Stockpiled Soil Material: Coordinate grading with site slopes to permit free drainage and prevent impounding of water.

D. Where impounded water on site exceeds 2 feet in depth, barricade the affected area until the water has subsided.

E. Flowing and Standing Water: Control to prevent erosion and excessive ponding. Do not discharge turbid water from the site, and prevent contamination of water on site by construction materials and debris including fuels and lubricants.
   1. Do not use filtering devices as a means of control.

1.4 SUBMITTALS

A. The implementation and construction, and maintenance of all slope stability and erosion control shall be the responsibility of the Contractor. Temporary slope stability and erosion control measures shall be maintained during construction and shall be removed and disposed of by the Contractor after completion of the Project and after notification of acceptance of stabilization. Right is reserved by the Owner's Representative to approve and authorize alterations.
   1. Indicate implementation date(s) and maintenance routine.
   2. Provide contact information, including telephone for the Contractor’s designated emergency response person.

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

C. Product Certification: For straw, documentation that shows either (1) that the straw is from a Washington State certified seed field or (2) the seed lab test results of the seed harvested from the straw.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer whose work has prior experience in implementing erosion and sediment control measures.

B. Preinstallation Conference: Conduct conference at Project Site to comply with requirements in Division 1 Section "Project Management and Coordination."

C. Reference Standards:

1. Snohomish County Drainage Manual Volume II: Construction Stormwater Pollution Prevention BMPs, July 2021
2. WSDOT “2023 Standard Specifications for Road, Bridge, and Municipal Construction”

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials to be delivered to site in original sealed, labeled, and undamaged packaging. Any damaged materials are to be disregarded on removed from the Project Site.

1.7 SCHEDULING

A. Implement Control Plan prior to start of site clearing and earthwork as necessary for effective prevention of erosion and sediment control based on conditions and the nature of the Work. Implement Control Plan at least two days prior to start of site clearing, earthwork and other activities that may disturb soils and vegetation.

B. Subsequent to approval and initial implementation modify the sediment and erosion control measures as necessary to adapt to changing site conditions due to the progress of the Work, environmental conditions and other factors that could reduce the effectiveness of initial measures. Modifications may include but are not limited to incorporation of permanent site improvements, extending controls already in place, and incorporating additional control measures.

C. Site Improvements included in the Work may be incorporated into the Contractor’s erosion and sediment control plan where acceptable to the Owner. Permanent facilities have not been designed for conditions during the construction period. Adequacy of these structures as temporary controls shall be determined by the Contractor. Provide temporary measures until permanent improvements are available.

1. At Substantial Completion, permanent improvements utilized by the Contractor for temporary controls shall be delivered to the Owner in as new condition.

1.8 MAINTENANCE

A. Periodically, and following each rainstorm and other significant weather events, inspect control measures and clean, reinforce and modify them as necessary to ensure continued control of erosion and sedimentation.

1. Removable Protective Devices: In place on each day for which the five day rain forecast is greater than 40 percent.
2. Immediately repair damage to slope surface protection and soil stabilization measures.

B. Maintain Erosion and Sediment control at planted areas for until Substantial Completion; comply with inspection and repair requirements throughout the project time period. Remove and dispose of controls upon written authorization following Substantial Completion.

C. From October 1 through April 30, an emergency response crew appropriately sized for the site area and the scope of control measures necessary, shall be available and able to respond to site emergency in a timely manner.

1. Maintenance and remedial materials for repair and extension of control measures shall be stock-piled on the Site for routine maintenance and emergency service measures as necessary to control conditions at the Site.
2. Emergency Contact Person shall be directly responsible for the emergency response crew.

PART 2 - PRODUCTS

2.1 CONSTRUCTION FENCING

A. Orange Polyethylene (HDPE) Mesh Fencing Fabric: 48 inch wide rolls.

B. Posts: 2 x 2 x 60 inch fir, pine, or metal fence posts.

2.2 EROSION CONTROL BLANKET

A. Erosion Control Blanket shall be 100 percent biodegradable woven from machine spun bristle twines with no seams. The blanket shall be Geocoir/DeKoWe 400, Rolanka Bio D Mat 40, or approved equal with the following minimum average roll properties:
   1. Thickness 0.35 inches (ASTM D1777).
   2. Average Tensile Strength 660lbs/ft (ASTM D4595).
   3. Weight 13.6 oz/sy (ASTM D3776).
   4. Open Area 65 percent (measured).
   5. Roll Width 6.5 and 13.1 feet (measured).
   6. Roll Length 165 feet (measured).
   7. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Wooden Stakes: Untreated Douglas Fir 3/4 x 1/2 x 18 inch wood stakes.

2.3 GRAVEL CONSTRUCTION ENTRANCE

A. Aggregate: 2-inch-minus gravel; ASTM D 448.

2.4 PLASTIC SHEETING

A. Polyethylene plastic (minimum of 6mm thick).

2.5 SILT FENCING

A. Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
   1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
   2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
   3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
   4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
   5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

B. Posts: 2 x 2 x 48 inch fir, pine, or metal fence posts.

2.6 MULCH

A. Mulch materials free of noxious weed seeds and plants and contain no substance detrimental to plant life. The materials shall not be moldy, caked, decayed or of otherwise low quality.

2.7 TACKIFIER

A. Coherex, Marloc, Soil Seal, J-Tack, or approved substitute.

2.8 EROSION CONTROL ACCESSORIES

A. Erosion Control Fabric: 700X by Mirafi or approved substitute.
B. Ground stabilization Fabric: 500X or 600X by Mirafi or approved substitute.
C. Staples: 6-inches long, U-shaped steel.

2.9 HYDROMULCH

A. Acceptable Hydromulch: Silva-fiber by Weyerhaeuser Company with erosion control seed as specified or as approved by Owner's Representative.

2.10 WATER

A. Make all necessary arrangements to provide water needed for Work.

2.11 STRAW WATTLES

A. Straw: Provide air-dry, clean, mildew-free and seed-free rice straw, or approved equal.
B. Plastic Netting: Tubular black plastic netting with a strand thickness of 0.30 inch and a knot thickness of 0.055 and a weight of 0.35 ounce per foot, and shall be made from 85 percent high density polyethylene.
C. Wooden Stakes: Untreated Douglas Fir 1 x 2 x 18 inch wood stakes, or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify site conditions and note irregularities affecting work of this Section.
B. Beginning work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

A. Construction Fencing:

1. Fencing to be installed in locations as shown on Drawings.
2. Installation of fencing per manufactures specifications. Fencing posts to be placed at a maximum of 8 feet O.C.

B. Erosion Control Blanket:
1. Install erosion control blanket in locations shown on Drawings.
2. Prior to installing blankets, apply any necessary lime, fertilizer, and seed.
3. Anchor beginning of blanket in 6 inch deep by 6 inch wide trench with approximately 12 inches of blanket extending beyond trench. Anchor blanket with a row of staples/stakes approximately 6 inches apart. Backfill and compact trench after stapling. Apply seed and compacted soil and fold and secure remaining 12 inches of blanket back over on itself with row of staple/stakes placed 12 inches apart.
4. Roll blankets either down slope or horizontally across slope. Unroll blankets per manufacturer's specifications and secure with staples in appropriate locations as shown in the manufacturer's staple pattern guide.
5. The edges of parallel blankets must be stapled together with a minimum of 6 inch overlap. Consecutive spliced together blankets must be placed end over end with a minimum of 6 inches of overlap. Staple through overlapped area, approximately 12 inches apart across entire blanket width.

C. Gravel Construction Entrance:
1. Construction entrances shall be installed at the beginning of construction and maintained for the duration of the project in a condition that will prevent tracking or flowing of sediment into public roadways. Apply a minimum 4-inch gravel layer construction entrance at approved access points around project site. Add subgrade reinforcement geotextile, as needed.
2. Existing gravel entrance or parking lot may constitute an appropriate gravel construction entrance, if approved by the Owner's Representative.
3. If the gravel pad does not adequately remove dirt and mud from vehicle wheels such that mud and dirt tracking is evident off site, additional measures must be taken. Such measures may include hosing off wheels before vehicles leave the site or other construction techniques/work operation modifications.
4. Wheel washing should be done on the gravel pad and wash water should drain through a silt-trapping structure prior to leaving the construction site. Where wheels from vehicles leaving the site are washed, ensure that water carrying sediments or other contaminates remains on gravel roadbed or designated surface.
5. Additional gravel shall be added periodically, if necessary, to maintain proper function of the pad.

D. Plastic Sheeting
1. Provide plastic sheeting during construction to prevent the transport of sediment from the Project Site as directed by the Owner's Representative.
2. Install the plastic sheeting over exposed or stockpiled soils and debris.

E. Silt Fencing:
1. Silt fencing shall be placed prior to any site grading or surface disturbance.
2. Provide silt fencing at tops of toes of slopes, and at edges of grading activities, and at locations indicated on the Drawings.
3. Posts to be placed at a maximum of 6 feet O.C. Embed silt fencing a minimum of 6 inches below subgrade.

F. Mulch
1. Perform the work only when local weather and other conditions are favorable to mulching. Do not undertake the work when wind velocities would prevent uniform application of materials or would drift materials.
2. Place mulch to a reasonably uniform thickness of 1-1/2 to 2-1/2 inches, and average approximately 2 inches in loose condition. Mulch may be spread by hand or with a mulch blower.

3. Apply a nontoxic copolymer to act as a tacking agent, either applied after the mulch is spread or sprayed into the mulch as it is being blown onto the soil.

G. Hydromulch
1. Apply hydromulch in slurry form with hydroseeding equipment at seed rate specified. See Division 2 Section “Lawns and Grasses.”

H. Straw Wattles
1. Straw wattles to be installed in locations as shown on Drawings. Straw wattles shall be placed along slope contours and staked 4 feet O.C. with wooden stakes.
2. Approved straw material shall be placed in black plastic netting. Straw waddles shall be 9 inches in diameter, 25 feet in length, and weigh approximately 30 pounds. The ends of the straw waddles shall be tightly butted together.

3.3 CATCH BASIN PROTECTION

A. Storm drain inlets which are operational prior to permanent stabilization of the disturbed area shall be protected to prevent sediment from entering the storm drain system.

B. Protect all catch basins, drains, and inlets from sedimentation using inlet sediment control devices, or other techniques approved by local jurisdiction.

3.4 MAINTENANCE

A. Maintenance and replacement, and upgrading of erosion control measures are the responsibility of the Contractor until all construction is completed and notification of acceptance of stabilization.

B. The erosion and sediment control measures must be installed in conjunction with clearing and grading.

C. All erosion and sediment control measures to be inspected daily and maintained as necessary to ensure continued functioning.

D. Stabilized gravel construction entrances will be installed at the beginning of construction and shall be maintained for the duration of the project. Additional measures must be taken by the Contractor when necessary to ensure that all paved areas are left clean for the duration of the project.

3.5 REPAIR

A. Site improvements including, but not limited to, on grade and subgrade construction, porous and nonporous pavement assemblies and landscaping was damaged or lost due to failure of erosion and sediment controls, (including required Contractor maintenance), shall be replaced and repaired as acceptable to the Owner's Representative at no additional cost to the Owner.
1. Drainage Systems obstructed by silt and debris due to noncompliance controls shall be cleaned and restored to full serviceability.
2. Remedial work shall include all work originally provided as Work of the Contract including but not limited to earthwork for subgrade improvements, and providing effective erosion and sediment controls.

3.6 SITE CLEAN UP

A. Upon completion of Project and after notification of acceptance of stabilization, Construction Fencing, Gravel Construction Entrances, Plastic Sheeting, Silt Fences, Straw Wattles, Inlet Protection and any other temporary erosion and sediment control measures are to be removed from the site by the Contractor within 30 days.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold milling of existing hot-mix asphalt pavement.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt paving.
   4. Hot-mix asphalt paving overlay.
   5. Asphalt surface treatments.
   6. Pavement-marking paint.

B. Related Sections:
   1. Division 02 Section " Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
   2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
   3. Division 32 Section "Concrete Paving" for joint sealants and fillers at paving terminations.

1.03 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
   1. HMA Pavement: For each job mix proposed for the Work provide confirmation that mix design is current on WSDOT's QPL list.
   2. Crushed Surfacing

B. Shop Drawings: Indicate pavement markings and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the WSDOT.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Section 5-04 the Standard Specifications for Road, Bridge, and Municipal Construction by WSDOT, 2023 edition (WSDOT Standard Specification).
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

E. Pre-installation Meeting:
   1. The general contractor, paving subcontractor, paving superintendent, owner's representative, and engineer shall meet at the office of the engineer one week prior to site paving. Attendance is mandatory by all parties.
   2. Contractor shall provide proposed methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
      a. Proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
      b. Graphic paving plan for review
      c. List of proposed equipment, including size of paving machine, rollers, and other compaction equipment.
      d. Estimated time work shall begin.
   3. The following shall be reviewed in detail:
      a. Review condition of subgrade and preparatory work.

b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
d. No vibratory compaction shall be allowed when the surface temperature of material is less than 185°F. All compaction equipment operators shall be in possession of an operating infrared heat gun to ensure compliance.
e. Tapering or feathering of asphalt joints shall not be allowed. Joints shall be stacked.
f. Paving activities shall not begin until surface temperatures have met those stated in Section 1.07.
g. Diesel shall not be stored on any paving machine during operations. Diesel shall not be used for any other purpose other than fueling equipment.

F. Subgrade Walk
1. Contractor and Engineer shall walk the prepared subgrade prior to paving activities. Any deficiencies identified during walk shall be corrected prior to paving.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 60 deg. F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg for water-based materials, and not exceeding 95-degree F. Retain paragraph below for coated imprinted asphalt.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.
B. Crushed Surfacing Base Course (CSBC) shall meet the requirements of Section 9-03.9(3) of the Standard Specifications except that the material shall not have more than 6% by dry weight pass the No. 200 sieve (wet sieve test).
C. Crushed Surfacing Top Course (CSTC) shall meet the requirements of Section 9-03.9(3) of the Standard Specifications except that the material shall not have more than 6% by dry weight pass the No. 200 sieve (wet sieve test).
D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64H-28 Min. 91% Compaction.
B. Asphalt Cement: ASTM D 946
C. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-250.
D. Prime Coat: Asphalt emulsion prime coat complying with Washington DOT requirements.
E. Water: Potable.
F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: ASTM D 6690, hot-applied, single-component, polymer-modified bituminous sealant.

E. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N, colors complying with FS TT-P-1952. All pavement markings (directional arrows, crosswalks, stop bars, ADA markings, and other items that are private) shall be painted with two coats. No thermoplastic markings stall be installed on the private applications.

1. Color:
    a. White: Federal Standard 595, color number 37875
    b. Yellow: Federal Standard 595, color number 33538
    c. Red: Federal Standard 595, color 31350
    d. Blue: Federal Standard 595, color number 35180

F. Glass Beads: AASHTO M 247, Type 1.

G. Wheel Stops, Concrete: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.04 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Crushed Surfacing Top Course meeting the requirements of WSDOT Standard Specification Section 9-03.9(3).
3. Crushed Surfacing Base Course meeting the requirements of WSDOT Standard Specification Section 9-03.9(3).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

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

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.02 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 3”.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt to asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.03 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.04 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.05 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.06 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.
7. Tapering or feathering of asphalt joints shall not be allowed. Joints shall be stacked.

3.07 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. No vibratory compaction shall be allowed when surface temperature of the material is less than 185°F.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Alignment: Bevel edges while asphalt is still hot; compact thoroughly.

G. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

I. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked. PAVEMENT MARKING

J. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

K. Allow paving to age for 30 days before starting pavement marking and not prior to pavement marker manufacturer recommendations.

L. Sweep and clean surface to eliminate loose material and dust.

M. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.08 FIELD QUALITY CONTROL

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

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement will be determined by a properly calibrated nuclear asphalt testing device.
   3. Compaction tests shall be performed at a rate of one per 5,000 square feet maximum, for each lift or course of asphalt concrete placed.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.09 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow milled materials to accumulate on-site.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes exterior cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes for the following:
   1. Concrete surface (4 IN.)
   2. Concrete surface (Reinforced - 6 IN.)
   3. Raised concrete vehicular connection ramp.
   4. Concrete curbs
   5. Concrete driveway aprons

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving" for subgrade preparation, grading and base course.
   2. Division 03 Section "Cast-in-Place Concrete" for concrete stairs, concrete bases, walls, and footings.
   3. Drawings and Sections 5-05, 8-04, 8-06, and 8-14 of the WSDOT 2023 Standard Specifications for Road, Bridge, and Municipal Construction, Amendments and Special Provisions (WSDOT Standard Specifications) for pervious cement concrete sidewalks.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other Pozzolans, and ground granulated blast-furnace slag.

1.03 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete mix indicated, submit mix design with substantiating test data in conformance with UBC Section 1905, a minimum of two weeks prior to scheduled pour.

C. Aggregates: Normal-weight aggregates used in concrete mix where exposed aggregate finish is specified.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

E. Minutes of pre-installation conference.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

C. Standard Specifications: Perform site concrete Work in compliance with the latest edition of the “Standard Specifications for Road, Bridge and Municipal Construction” prepared by Washington State Department of Transportation (WSDOT) and American Public Works Association (APWA), Washington State Chapter. Comply with the more stringent of the WSDOT Sections of Division 5, 6, and 9 or the ASTM Standards listed below.

D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

E. Formwork Observation: Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Notify Owner’s Representative 48 hours minimum prior to placing concrete that formwork is in place and ready for observation. Do not proceed with concrete placement prior to obtaining Owner’s Representative’s approval that formwork meets the lines and grades intended on the Drawings. Concrete placed without the Owner’s Representative’s approval of formwork shall be removed and replaced at no additional cost to the Owner.

1.05 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Provide barricades, cones and signs required for driveway closures and detours. See Section 1-10 of the WSDOT Standard Specifications for additional requirements.

B. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost.

C. Weather Limitations for Adhesive Application: Apply adhesive for tactile warning mats only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.

1.06 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering and wear.
   b. Separation or delamination of materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Provide appropriate form liner material to shape the reveal patterns indicated on the Drawings.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Reinforcing and Tie Bars: ASTM A 615/A 615M, Grade 60; deformed.

B. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

C. Plain Steel Wire: ASTM A 82, as drawn.

D. Deformed-Steel Wire: ASTM A 496.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or II or I/II, gray. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class C or F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4M coarse aggregate, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: Not exceeding 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement, when tested in accordance with ASTM C 1260.
3. Aggregate Sizes: 3/4 to 1 inch nominal.
4. Aggregate Sizes: 1/2 to 3/4 inch nominal.
5. Aggregate Sizes: 3/8 to 5/8 inch nominal.

C. Water: ASTM C 94.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

2.04 RELATED MATERIALS

A. Expansion Joint Filler Strips: ASTM D 3575, 1/2-inch closed-cell polyurethane foam backing, with removable joint cap, Sonneborn Sonolastic Expansion Joint Filler, or approved equal.

B. Joint Primer: ASTM C 920, Type S, Grade P, Class 25. Solvent based primer for preparing concrete surfaces for adhesion to sealant. Sonneborn Sonolastic Primer 733, or approved equal.

C. Joint Sealant: ASTM C 920, Type S, Grade P, Class 25. Non-priming, single-component, polyurethane sealant, Sonneborn Sonolastic SL1, or approved equal.

D. Backer Rod: Non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants where joint depth exceeds manufacturer's recommended depth for joint sealant. Comply with ASTM C 1330, Type C. Size as required for joint design. Sonneborn Sonolastic Closed-Cell Backer Rod, or approved equal.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Curing Compounds for Non-Colored Cement Concrete: Clear, ASTM C 309, non- staining.

2.05 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 3000 psi.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
   3. Slump Limit: 4 to 4-1/2 inches without Water-Reducing Admixtures; 5 inches with Water-Reducing Admixtures.
      a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: When a high-range water-reducing admixture is used, the maximum limit may be increased an additional 2 inches.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4 to 6 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture and/or high-range, water-reducing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
   1. Fly Ash or Pozzolans: 25 percent.
   2. Ground Granulated Blast-Furnace Slag: 50 percent.
   3. Combined Fly Ash or Pozzolans, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or Pozzolans not exceeding 25 percent.

2.06 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 and 90 degrees Fahrenheit reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

C. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.07 DETECTABLE WARNING MATS

A. Surface-Applied Detectable Warning Mats: Accessible truncated-dome detectable warning resilient mats, UV resistant, manufactured for adhering to existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of mat, and beveled outside edges.
   1. Material: Modified rubber compound, UV resistant.
   2. Color: Yellow.
   3. Shapes and Sizes: Rectangular Panel, 24 by 48 inches.
   4. Dome Spacing and Configuration: min. 1.6-inch to max. 2.4-inch spacing in square pattern.
   5. Mounting: Adhered to pavement surface with adhesive and fastened with fasteners.

B. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following.
   1. Type 304 stainless-steel fasteners for exterior use.
   2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

C. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

D. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with concrete placement operations only after nonconforming conditions have been corrected.

C. Verify that pavement is in suitable condition to begin installation of detectable warning mats in according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

3.02 PREPARATION

A. Proof-roll prepared base course surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted base course surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Formwork: Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

B. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than 1/2-hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated.
2. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys where concrete pavements abut job-built concrete curbs, unless otherwise indicated on the Drawings. Embed keys at least 1-1/2 inches into concrete.

C. Expansion Joints: Form expansion/isolation joints of preformed joint-filler strips abutting catch basins, manholes, inlets, light pole bases, structures, walks, other fixed objects, and where indicated on the Drawings.

1. Doweled Joints: Install dowel bars where new concrete paving meets existing concrete paving. Drill and epoxy one-half of bar into existing paving. Lubricate, asphalt-coat, or provide PVC sleeve on the half of dowel length embedded in new concrete to prevent concrete bonding to that side of joint.
2. Doweled Expansion Joints: Install dowel bars and support assemblies at joints where indicated on the Drawings. Lubricate, asphalt coat, or provide PVC sleeve on one-half of dowel length to prevent concrete bonding to one side of joint.
3. Locate expansion joints at intervals of 20 feet maximum, unless otherwise indicated on the Drawings.
4. Extend joint fillers full width and depth of joint.
5. Terminate joint filler flush with top of paving for joint fillers having removable joint cap.
6. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
8. Allow concrete to cure minimum of 28 days.
9. Remove joint filler cap; clean and prime concrete surfaces to receive sealant per manufacturer’s recommendations; and fill void with sealant to match concrete color.
10. If joint filler depth from top of paving exceeds 3/8 inch, install backer rod prior to installing joint sealant. Backer rod to be 25 percent wider than joint width. Sealant depth to be 1/2 width of joint, not to exceed 3/8 inch, whichever is smaller. Install backer rod and sealant per manufacturer’s recommendations
11. Protect sealant from pedestrian traffic until cured.
12. Clean excess sealant from paved surfaces.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, at intervals of 10 feet maximum, unless otherwise indicated on the Drawings, and as follows:

1. Score Joints: Form score joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4 inch radius. Repeat grooving of score joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

E. Edging: Tool exposed edges of ramps, sidewalks, walkways and joints in concrete after initial floating with an edging tool to a 1/2 inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from base course surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten base course to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete pavement in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Owner’s Representative.

J. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. When adjoining concrete pavements are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 CONCRETE FINISHING

A. Float Finish Concrete Pads: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
B. Comply with ACI 306.1 for cold-weather protection.
C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq.-ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 for driveways, roadways, ramps, sidewalks, walkways, and as follows:
1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Joint Spacing: 3 inches.
8. Contraction Joint Depth: Plus 1/4 inch, no minus.
9. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least 1 composite sample per day, minimum.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees Fahrenheit and below and when 80 degrees Fahrenheit and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test 1 specimen at 7 days and 2 specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Owner’s Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner’s Representative but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Owner’s Representative.

G. Remove and replace concrete where test results indicate that it does not comply with specified requirements at no additional cost to the Owner.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to the Owner.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete that is broken, damaged, or defective or that does not comply with requirements in this Section at no additional cost to the Owner.

B. Drill test cores, where directed by Owner’s Representative, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory concrete areas with portland cement concrete bonded with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.12 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Lay out detectable warning mats as indicated and mark concrete pavement at edges of mats.

C. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.

D. Apply adhesive to back of mat in amounts and pattern recommended by manufacturer, and set mat in place. Firmly seat mat in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to mat to ensure full contact with adhesive.
E. Install anchor devices through face of mat and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with mat surface.
F. Mask mat perimeter and adjacent concrete, and apply sealant in continuous bead around perimeter of mat.
G. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning mat and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.
H. Protect installed mat from traffic until adhesive has set.

3.13 CLEANING

A. Remove all excess material, debris, and equipment from site upon completion of work in this Section. Keep work area clean and in an orderly condition during the course of the Work.
B. Do not dispose of waste concrete or wash out materials on the site unless otherwise directed by the Owner's Representative. Areas to be paved may be acceptable for concrete truck wash areas only as approved by the Owner's Representative.
C. Remove and replace detectable warning mats that are broken or damaged or do not comply with requirements in this Section. Replace using detectable warning mat installation methods per manufacturer recommendations.
D. Protect detectable warning mats from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

SECTION 33 3113
SITE SANITARY SEWAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 31 Section "Earth Moving" for utility trenching and backfill.

1.02 SUMMARY

A. This Section includes gravity-flow, non-pressure sanitary sewerage outside the building, with the following components:

1. Cleanouts
2. Manholes
3. Piping
4. Oil/Water Separator

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride plastic (SDR 35).

1.04 QUALITY ASSURANCE

A. Reference Standards:

1. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating per 2018 APWA.
2. WSDOT "2023 Standard Specifications for Road, Bridge, and Municipal Construction".

1.05 SUBMITTALS

A. Field quality-control test reports.

B. Product data for the following:

1. Piping material
2. Cleanouts
3. Manholes
4. Oil/Water Separator
5. Fittings and Gaskets

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight. Adequately support materials to prevent sagging.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35 minimum stiffness shall be 46 PSI per A STM D-2412. The joints type shall be elastomeric gasket conforming to ASTM D-3212.

2.02 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to clean out of same material as sewer piping.

2.03 ECCENTRIC REDUCER

A. Spears or approved equal. Schedule 80 PVC reducer manufactured to ASTM D 2467 for use with pipe manufactured to ASTM D 1785.

2.04 OIL/WATER SEPARATOR

A. OT-500 by Striem or approved equal.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling per Division 31 Section "Earth Moving".

3.02 PIPING APPLICATIONS

A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping, unless otherwise indicated.

B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, if allowed by the local permit issuing authority.
   1. PVC sewer pipe and fittings, gaskets, and gasketed joints.

3.03 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, non-pressure, drainage piping according to the following:
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
   2. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

E. Clear interior of piping of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, piping according to the following:
   1. Join PVC sewer piping according to ASTM D 2321 for elastomeric gasket joints.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.05 STRUCTURE INSTALLATION

A. Concrete structures shall meet the Snohomish County sanitary sewer standards.

B. Oil/Water Separator shall have a 250-gallon capacity per the provided manufacturer’s detail on the plans, or approved equal.

3.06 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building’s sanitary building drains in accordance with local permit issuing authority standards.

B. Make connections to existing piping and underground manholes.
   1. Connect to existing 6” sewer line at the location shown on the contract documents using an eccentric reducer.
   2. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
   3. Coordinate inspection of all manhole connections with local permit issuing authority and Owner.

3.07 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving" Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
   1. Use detectable warning tape over ferrous and nonferrous piping.
   2. All non-metallic pipe shall be installed with #14 copper tracer wire.

3.08 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate report for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air test gravity sanitary sewer piping in accordance with deflection tested in accordance with 2018 APWA/2023 WSDOT.

C. Leaks and loss in test pressure constitute defects that must be repaired.
D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.
E. Hydrostatic test concrete manholes in accordance with 2018 APWA/2023 WSDOT.

3.09 CLEANING

A. Clean interior of piping of dirt and superfluous material.

END OF SECTION