Soderstrom Architects

CITY OF
Millersburg
A COMMUNITY LINKING
AGRICULTURE AND INDUSTRY

Project Manual

Millersburg Fire Station 15
City of Millersburg

Bid Set - 2/3/2021
Job No. 20006

1200 NW Naito Parkway Suite Number 410 | Portland, OR 97209 | Main 503.228.5617 | Fax 503.273.8584 | **sdra.com**

SECTION 00 0105
STAMPS AND SEALS

PROJECT

MILLERSBURG FIRE – STATION 15
MILLERSBURG, OREGON

OWNER

CITY OF MILLERSBURG

ARCHITECT OF RECORD

SODERSTROM ARCHITECTS, LTD

DIVISIONS 0-14, Unless otherwise noted in subsequent Seals Pages.

END OF SECTION

00 0107

SEALS PAGE

MECHANICAL ENGINEER

Corbin Consulting Engineers

1905 NW 169th Place Suite 121

Beaverton, OR 97006

Telephone: (503) 645-0176

Mechanical Contact: Jeff Stauffer, PE

Email: Jeff.Stauffer@corbinengineering.com

ELECTRICAL ENGINEER

Corbin Consulting Engineers

1905 NW 169th Place Suite 121

Beaverton, OR 97006

Telephone: (503) 645-0176

Electrical Contact: Joshua Parker, PE

Email: Joshua.Parker@corbinengineering.com

END OF SECTION

SECTION 00 0110

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END OF SECTION

CITY OF MILLERSBURG, OREGON

CONTRACT DOCUMENTS
FOR
CITY OF MILLERSBURG FIRE STATION 15

Issue Date: February 3, 2021
Due Date: March 9, 2021

Architect, Soderstrom.....**Erica Jankowski, AIA**
City Manager ..... **Kevin Kreitman, EFO**
City Engineer ..... **Janelle Booth, P.E.**
Owner's Representative, David Evans & Associates.....**Jeff Woodward**

For more information on this project,
contact Janelle Booth, 458-233-6302.

CITY OF MILLERSBURG

Fire Station 15

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BIDDER'S SUBMITTAL CHECKLIST

Any bid submitted after the designated closing time or to any other location will be determined nonresponsive and will not be opened. It is the responsibility of the Bidder to deliver the bid by the indicated deadline to the designated location. The City is not responsible for late or mishandled delivery.

If contractor obtains these documents by means of a website or copied from a Plan Center, it is the responsibility of the contractor to check for any addendums to this contract prior to bid opening. To be notified of addendums, contractor may call 458-233-6300 and request to be added to the Plan Holder's list.

Failure to include any signed addendums could result in the disqualification of your bid.

All bids must be submitted on City-provided forms that do not contain unauthorized alterations. Bids should be received in non-editable PDF format. The total size limit for each email submittal response should be less than 20 MB. A response will be sent back to the sender stating, "Proposal has been received by the City." If you do not receive a notification, you may contact Kimberly Wollenburg at kwollenb@cityofmillersburg.org or 458-233-6300.

All bids must include the following submittals or may be considered nonresponsive:

- ☐ Signed Proposal (*two pages*) - *with all applicable blanks completed*
- ☐ Completed Schedule of Contract Prices - *signed by an authorized representative of the company who can "execute bids"*
- ☐ Completed AIA Document A305 - 2020 – Contractor's Qualification Statement – *including Exhibits A through E*
- ☐ Bid Bond – *using City-provided Bid Bond form with no alterations*
- ☐ Employee Drug Testing Certification form
- ☐ Signed Addenda *(if Addenda have been issued)*

Submitted within two hours after bid closing time (required under ORS 279C.370):

- ☐ First-Tier Subcontractor Disclosure form – signed and if "none" indicate as such

Other than what is listed above, it is not necessary to submit any additional pages with the bid.

NOTICE TO CONTRACTORS
CITY OF MILLERSBURG
INVITATION TO BID

Engineer's Estimate: Schedule A: $4,893,000, Schedule B: $1,140,000
Bids due at 2:00 p.m., March 9, 2021

The City of Millersburg hereby extends an invitation to submit bids for

City of Millersburg Fire Station 15:

Schedule A (Base Bid): Construction of a 10,200 SF new fire station, including site work and construction of new public street.

Schedule B (Bid Alternates):

Alternate No. B1: Bi-fold doors in place of overhead doors (3 doors) on the south side of the apparatus bay.
Alternate No. B2: 1x6 tongue and groove boards or gypsum board ceiling in place of Armstrong Woodworks Vector wood ceiling system at areas indicated to receive wood ceiling.

The Contract, if awarded, will be awarded based on the best value to the City of Millersburg, determined by scoring of the lowest total bid amount of Schedule A plus any, all, or none of the additive alternate bid items, and Contractor's Qualification Statement, at the City's sole and absolute judgment to best serve its interest. The Contractor must bid both schedules.

Bids must be submitted to clerk@cityofmillersburg.org **not later than 2:00 p.m. (Pacific Time), Tuesday, March 9, 2021**. Bids will be considered time-stamped and received by the City when received in the email inbox. The email subject line must include the project number and name as follows: "City of Millersburg Fire Station 15." The body of the email must plainly identify (1) the project name, (2) the bid opening time and date, (3) the bidder's name, and (4) the contractor's license number (per ORS 701). If necessary due to file size, submittals may be sent via multiple emails. All required pieces must be received and time-stamped prior to the filing deadline. It is preferred that bids be submitted electronically, however hard copies will also be accepted via the walk-up window at Millersburg City Hall. The time-stamp utilized for hard copy submittals will be the same as the email time-stamp, per City computer system. Immediately following the filing deadline, the bids will be opened and publicly read using a virtual hosted meeting, https://aspenuc.accessionmeeting.com/j/1156192244. Interested parties can also dial in using their phones (1-503-212-9900, access code 115-619-2244). Bid totals will be posted on the City's website at https://www.cityofmillersburg.org/rfps.

Contract bid documents may be downloaded from the City of Millersburg website at https://www.cityofmillersburg.org/rfps or a printed set may be purchased for $120. It is imperative those who download the contract bid documents check the website regularly for addenda, clarifications, and other pertinent notifications. All who are known by the City of Millersburg to have received a complete set of the contract bid documents will receive notification when additional items are posted. Please call 458-233-6300 to be added to the Plan Holder's list.

Each bidder must have access to a current set of City of Albany *Standard Construction Specifications*, which can be found on the City of Albany's website at *http://www.cityofalbany.net/standard-construction-specifications* or a printed set may be purchased for $100. All public improvements are required to conform to these specifications, except as specifically modified in the Special Provisions, and bid prices must reflect these specifications. For general project or bidding information, call Janelle Booth at 458-233-6302. For technical questions, contact Erica Jankowski at ericaj@sdra.com.

All City contracts contain a statement declaring that the bidder agrees to comply with the provisions of ORS 279C.800 through 279C.870 regarding payment of prevailing wages. The City's contract contains a clause which incorporates by reference all of the provisions of ORS Chapter 279C which are applicable to public contracts. Bidders are expected to be familiar with these provisions including, but not limited to, recent changes to ORS Chapter 279C.

Bids must not be received or considered unless the bidder is licensed by the Construction Contractors Board for construction projects or licensed with the State Landscape Contractors Board for landscaping projects.

A 10% bid bond, certified check, or cashier's check must accompany each bid on all projects and must be forfeited if the bidder fails to enter into a Contract with the City of Millersburg within 10 days after the date of the Notice of Award.

DATED this 3rd day of February 2021.

Kimberly Wollenburg
City Recorder

PUBLISH: Daily Journal of Commerce on Wednesday, February 3, 2021
Albany Democrat-Herald on Friday, February 5, 2021

PROPOSAL

To the Honorable Mayor and City Council
Millersburg, Oregon 97321

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned Bidder declares that the Contract Documents for the construction of the proposed improvement have been carefully examined; that the site has been personally inspected; that the Bidder is satisfied as to the quantities of materials, items of equipment and conditions or work involved including the fact that the description of the quantities of work and materials as included herein is brief and is intended only to indicate the general nature of such items and to identify the said quantities with the detailed requirements of the Contract Documents; and that the Bidder's proposal is made according to the provisions and under the terms of the Contract Documents, which documents are hereby made a part of this proposal.

The Bidder further declares that the only persons or parties interested in this proposal are those named herein; that this proposal is in all respects fair and without fraud; that it is made without collusion with any official of the City of Millersburg, and that the proposal is made without any connection or collusion with any person making another proposal on this Contract.

The Bidder further declares by the signing of this proposal that all the provisions required by ORS 279C.800 through 279C.870 relating to the payment of prevailing wage rates for work performed under the Contract with the City of Millersburg must be complied with.

The Bidder further agrees that its own judgment has been exercised regarding the interpretation of subsurface information and all data which it believes pertinent from the Architect/Engineer, Owner, and other sources in arriving at these conclusions have been utilized.

The bidder further certifies that they have authority and knowledge regarding the payment of taxes and that to the best of their knowledge are not in violation of any Oregon Tax Laws. For purposes of this certification, "Oregon Tax Laws" are those tax laws imposed by ORS 320.005 to 320.150 and ORS 403.200 to 403.250 and ORS Chapters 118, 314, 316, 317, 318, 321, and 323; the elderly rental assistance program under ORS 310.630 to 310.706; and any local tax laws administered by the Oregon Department of Revenue under ORS 305.620.

CONTRACT EXECUTION, BONDS, AND INSURANCE

The Bidder agrees that if this proposal is accepted:

- A Contract with the City of Millersburg, Oregon, will be executed, within 10 days after the date of the Notice of Award, in the form of Contract annexed hereto, and will at that time, deliver to the City of Millersburg the 100 percent Performance Bond and 100 percent Payment Bond, and will, to the extent of this proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete all work as specified or shown in the Contract Documents.
- A Request for Taxpayer Identification Number and Certification (W-9) will be completed as a condition of the City's obligation to make payment. In the event the Bidder shall fail to complete and return the W-9 to the City, payment to Bidder may be delayed, or the City may, in its discretion, terminate the Contract.
- Automatic Clearing House (ACH) Direct Payment Authorization. The City prefers to pay Contractor invoices via electronic funds transfers through the ACH network. To initiate this more timely, efficient, and secure payment method, Contractors must complete the City's ACH Vendor Direct Payment Authorization Form, which will be provided. Information provided on the form is exempt from public records disclosure under ORS 192.501(27).
- **For contracts that exceed $500,000, the Contractor must elect retainage to be held in an interest-bearing escrow account, or an alternate method in lieu of cash retainage as a condition of payment and as required by ORS 279C.570(2).** Contractor must complete an Escrow Account Agreement if funds are to be held in an interest-bearing account, otherwise Contractor must provide a deposit of bonds, securities or other instruments, or Contractor must provide a surety bond in an amount equal to five percent of the total bid. City may recover from Contractor additional costs incurred in the handling of retainage alternatives, whether a deposit of bonds, securities, or other instruments, surety bond, or for an interest-bearing account, ORS 279C.560(3).

CERTIFICATES OF INSURANCE

The Bidder agrees to furnish the Owner, before commencing the work under this Contract, the certificates of insurance as specified in the City of Albany *Standard Construction Specifications*.

START OF CONSTRUCTION AND CONTRACT COMPLETION DATE

If awarded this contract, the Bidder agrees to begin work within 10 calendar days after the date of the Notice to Proceed for the Contract and to complete the construction, in all respects, as set forth in the Special Provisions of these Contract Documents.

LIQUIDATED DAMAGES

In the event the Bidder is awarded the Contract and fails to complete the work within the time stated above or extended time agreed upon, as more particularly set forth in the Contract Documents, liquidated damages must be paid to the City of Millersburg, Oregon, as provided under General Requirements, Subsection 108.06.00 of the City of Albany *Standard Construction Specifications*.

BID BOND

Accompanying this proposal is a certified check, cashier's check or Bidder's bond in the sum of (10% of Bid Total) _____ Dollars ($_____),
according to the General Requirements of the Contract Documents which is to be forfeited as liquidated damages, if, in the event that this proposal is accepted, and the Bidder fails to execute the Contract and furnish satisfactory Performance and Payment Bond under the conditions and within the time specified in the Contract Documents; otherwise said check or bond is to be returned to the Bidder.

SURETY

If the Bidder is awarded a construction Contract on this proposal, the Surety who provides the Performance Bond will be _____ whose address is (street and city) _____ and Payment Bond will be _____ whose address is (street and city) _____.

LUMP SUM OR UNIT PRICE WORK

The Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on the following lump sum or unit price amounts, it being expressly understood that the unit prices are independent of the exact quantities involved. The Bidder agrees that the lump sum prices and the unit prices represent a true measure of the labor and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

BIDDER

The name of the Bidder submitting this proposal is _____doing business at (street and city) _____, which is the address to which all communications concerned with this proposal and with the Contract must be sent.

In accordance with ORS 279A.120, Bidder hereby declares that it (circle correct designation) is / is not a resident Bidder. The names of the principal officers of the corporation submitting this proposal, or of the partnership, or of all persons interested in this proposal as principals are as follows:

_____ _____

If Sole Proprietor or Partnership: IN WITNESS hereto the undersigned has set his/her hand this _____ day of _____ 2021.

_____ _____

Signature of Bidder Title

If Corporation: IN WITNESS WHEREOF the undersigned corporation has duly authorized the execution of this agreement on behalf of the corporation by the officer named below this _____ day of _____2021.

_____

name of corporation

By: _____

Name: _____

(please print name)

Title: _____

SCHEDULE OF CONTRACT PRICES

Contractors shall complete all Schedules, all Alternate Bid Items, and Unit Cost in order for their bid to be considered complete.

SCHEDULE A: FIRE STATION 15				
ITEM NO.	**BID ITEMS**	**APPROX. QUANTITY**	**UNIT OF MEASURE**	**TOTAL AMT. DOLLARS/CTS**
Schedule A: Base Bid				
A1	Construct Fire Station 15	1	Lump Sum	
A2	Construct Fire Station 15 Public Street Improvements	1	Lump Sum	
SUM OF EXTENDED TOTALS – SCHEDULE A: FIRE STATION 15				

UNIT COST - Over-excavation of unsuitable onsite materials, including offsite disposal and structural backfill. Provided for information:

Over Excavation & Engineered Backfill	$	

The Contract, if awarded, will be awarded based on the best value to the City of Millersburg, determined by scoring of the lowest total bid amount of Schedule A plus any, all, or none of the additive alternate bid items, and Contractor's Qualification Statement. Scoring shall be as described in Special Provisions Section I-7.

Any, all or none of the alternates listed below may be awarded at the City's discretion if funding is available. Alternates are NOT listed in any order of City preference.

ADDITIVE ALTERNATE BID ITEMS				
ITEM NO.	**BID ITEMS**	**APPROX. QUANTITY**	**UNIT OF MEASURE**	**TOTAL AMT. DOLLARS/CTS**
B1	Bi-fold Doors in Place of Overhead Doors on South Side of Building (3 total)	1	Lump Sum	

DEDUCTIVE ALTERNATE BID ITEMS				
ITEM NO.	**BID ITEMS**	**APPROX. QUANTITY**	**UNIT OF MEASURE**	**TOTAL AMT. DOLLARS/CTS**
	Base bid: provide Armstrong Woodworks Vector wood ceiling system at areas indicated to receive wood ceiling	---	---	---
B2a	Provide 1x6 tongue and grove boards, clear stained, attached to 1/2" plywood substrate at areas indicated to receive wood ceiling	1	Lump Sum	
B2b	Provide gypsum board ceiling at areas indicated to receive wood ceiling	1	Lump Sum	

NOTE: Subject to change if addition or extensions are in error.

Bidder's Signature _____ Company Name (*please print*) _____ Date _____

Bidder's Name (*please print*) _____ Mailing Address (*please print*) _____ CCB License Number _____

Bidder's Title (*please print*) _____ City, State Zip _____ Federal Tax ID Number _____

Telephone No.: _____ Fax No.: _____ Email: _____

BID BOND

BOND NO. _____

AMOUNT OF BID: $ _____

KNOW ALL MEN BY THESE PRESENTS, that _____ hereinafter called the PRINCIPAL, and _____ a corporation duly organized under the laws of the State of _____ having its principal place of business at _____, in the State of _____, and authorized to do business in the State of Oregon, as SURETY, are held firmly bound unto the City of Millersburg, Oregon, hereinafter called the OBLIGEE, in the sum of _____ _____DOLLARS ($_____), for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND IS SUCH THAT:

WHEREAS, the PRINCIPAL is herewith submitting his/her/its Bid Proposal for **CITY OF MILLSERBURG FIRE STATION 15**, said Bid Proposal, by reference thereto, being hereby made a part hereof.

NOW, THEREFORE, if the Bid Proposal submitted by the PRINCIPAL is accepted, and the Contract awarded to the PRINCIPAL, and if the PRINCIPAL executes the proposed Contract and furnishes such Performance Bond and Payment Bond as required by the Contract Documents within the time fixed by the documents, then this obligation will be void; if the PRINCIPAL fails to execute the proposed Contract and furnish the bond, the SURETY hereby agrees to pay to the OBLIGEE the said sum as liquidated damages, within ten (10) days of such failure.

Signed and sealed this _____ day of _____ 2020.

_____	_____
PRINCIPAL	SURETY
By: _____	By: _____
	Attorney in Fact

EMPLOYEE DRUG TESTING PROGRAM CERTIFICATION

ORS 279C.505 (2) requires that bidders shall demonstrate and disclose to the City of Millersburg that he/she has an employee drug testing program in place before a public contract can be awarded.

Therefore, by signing this Certification, the Bidder does hereby certify and confirm that, as the proposed general contractor for City of Millersburg Project **City of Millersburg Fire Station 15** that he/she has an employee drug testing program in place that is consistent with, and satisfies the intent of, the above-referenced legislation.

CONTRACTOR: _____

BY: _____

TITLE: _____

DATE: _____

FIRST-TIER SUBCONTRACTOR DISCLOSURE

PROJECT NAME: City of Millersburg Fire Station 15 **PROJECT NUMBER:** 2020-01

BID CLOSING DATE: March 9, 2021 **TIME:** 2:00 p.m.

This form must be submitted at the location specified in the Invitation to Bid on the advertised bid closing date and within two working hours after the advertised bid closing time.

List below the name of each subcontractor that will be furnishing labor or will be furnishing labor and materials and that is required to be disclosed, the category of work that the subcontractor will be performing and the dollar value of the subcontract.

Enter "**NONE**" if there are no subcontractors that need to be disclosed.
(***Attach additional sheets if needed***.)

Failure to submit this signed form by the disclosure deadline will result in a nonresponsive bid.
A nonresponsive bid will not be considered for award.

Subcontractor's Name	Category of Work	Dollar Value
1.		$
2.		$
3.		$
4.		$
5.		$
6.		$
7.		$
8.		$
9.		$

Form submitted by (bidder name): _____ Phone No.:_____
(Signature)

Contact Name:_____ Company:
_____

ORS 279C.370 First-tier subcontractor disclosure. (1)(a) Within two working hours after the date and time of the deadline when bids are due to a contracting agency for a public improvement contract, a bidder shall submit to the contracting agency a disclosure of the first-tier subcontractors that:

(A) Will be furnishing labor or will be furnishing labor and materials in connection with the public improvement contract; and

(B) Will have a contract value that is equal to or greater than five percent of the total project bid or $15,000, whichever is greater, or $350,000 regardless of the percentage of the total project bid.

(b) For each contract to which this subsection applies, the contracting agency shall designate a deadline for submission of bids that has a date on a Tuesday, Wednesday or Thursday and a time between 2 p.m. and 5 p.m., except that this paragraph does not apply to public contracts for maintenance or construction of highways, bridges or other transportation facilities.

(c) This subsection applies only to public improvement contracts with a value, estimated by the contracting agency, of more than $100,000.

(d) This subsection does not apply to public improvement contracts that have been exempted from competitive bidding requirements under ORS 279C.335 (2).

(2) The disclosure of first-tier subcontractors under subsection (1) of this section must include the name of each subcontractor, the category of work that each subcontractor will perform and the dollar value of each subcontract. The information shall be disclosed in substantially the following [above] form:

(3) A contracting agency shall accept the subcontractor disclosure. The contracting agency shall consider the bid of any contractor that does not submit a subcontractor disclosure to the contracting agency to be a nonresponsive bid and may not award the contract to the contractor. A contracting agency is not required to determine the accuracy or the completeness of the subcontractor disclosure.

(4) After the bids are opened, the subcontractor disclosures must be made available for public inspection.

(5) A contractor may substitute a first-tier subcontractor under the provisions of ORS 279C.585.

(6) A subcontractor may file a complaint under ORS 279C.590 based on the disclosure requirements of subsection (1) of this section.

State of Oregon WH-179 (08-10-10)

SAMPLE CONTRACT

THIS CONTRACT is made between the CITY OF MILLERSBURG, a municipal corporation, hereinafter called "City" and _____, hereinafter called "Contractor."

WITNESSETH:

The Contractor, in consideration of the sums to be paid and other covenants herein contained, agrees to perform and complete the work herein described and to furnish all necessary machinery, tools, apparatus, equipment, supplies, materials, and labor and perform all work in accordance with the applicable *Standard Construction Specifications*, the Special Specifications (aka Specifications, Special Provisions) found herewith, and in accordance with such alterations or modifications of the same as may be made by the City, and according to such directions as may from time to time be made or given by the Engineer under the authority and within the meaning and purpose of this Contract. This agreement shall be binding upon the heirs, executors, administrators, successors, and assigns of the Contractor.

The applicable Drawings, the Project Specifications, the applicable *Standard Construction Specifications*, all sections of Special Provisions, and the Schedule of Contract Prices bound herewith are hereby specifically referred to and by reference made a part hereof and shall by such reference have the same force and effect as though all of the same were fully inserted herein.

The Contractor must faithfully complete and perform all of the obligations of this Contract, and in particular, must promptly, as due, make payment of all just debts and obligations incurred in the performance of said Contract and must not permit any lien or claim to be filed or prosecuted against the City.

The Contractor must furnish to the City a 100% Performance Bond and a 100% Payment Bond. In addition to the required Payment Bond and Performance Bond, unless exempt under ORS 279C.836 (7), (8), or (9), the contractor is required to file a $30,000 Public Works Bond with the Construction Contractor's Board to be used exclusively for unpaid wages determined to be due by BOLI. The general contractor is required to verify that subcontractors have filed a public works bond before permitting a subcontractor to start work on a project unless exempt under ORS 279C.836 (7), (8) or (9).

The Contractor, its subcontractors, if any, and all employers working under this Contract are subject employers under the Oregon Workers' Compensation Law and must comply with ORS 656.017, which requires them to provide workers' compensation coverage for all their subject workers.

The Contractor agrees to protect, indemnify, and hold harmless the City against any and all loss, claims, or suits (including costs and attorney's fees) for or on account of injury to or death of persons, damage to, or destruction of property belonging to either the City or others occurring by reason of the act or neglect of the Contractor, Contractor's employees, or agents (including subcontractors) in connection with the performance of this Contract.

It is expressly understood that this Contract must be governed by the laws of the State of Oregon. The statutes of the State of Oregon for public works contracts, specifically but not exclusively ORS Chapter 279 A-C as amended or superseded, including the latest additions and revisions, are incorporated by reference as part of the contract documents, and the party contracting with the City of Millersburg hereby covenants and agrees to comply with all of the obligations and conditions applicable to public contracts pursuant to ORS 279 A-C, et seq, as though each obligation or condition were set forth fully herein. In addition, if the contract identified above calls for a public improvement as that term is defined by ORS 279A.010, the party contracting with the City of Millersburg further agrees to comply with all obligations and conditions applicable to public contracts for public improvements pursuant to ORS 279C, et seq, as though each obligation or condition were set forth fully herein. Contractor and its subcontractors, if any, agree to comply with the Oregon Consumer Information Protection Act, ORS Sections 646A.600 through 646A.628.

The Contractor further declares by the signing of this Contract that all the provisions required by ORS 279C.800 through 279C.870 relating to the payment of prevailing wage rates for work performed under the Contract with the City of Millersburg must be complied with, and that daily/weekly/holiday/weekend overtime will be paid, unless the amount of the contract is $50,000 or less, in which case the prevailing wage rate requirement shall not apply. If Contractor fails, neglects, or refuses to make prompt payment for labor or services, the City can pay and withhold these amounts from payments due the contractor (ORS 279C.515). Contractor must indemnify the City from claims of damages resulting from actual or alleged violations of these obligations.

The Contractor understands that if the price of this Contract exceeds $500,000, the City will deposit amounts withheld as retainage into an interest-bearing escrow account for the benefit of the City as outlined in ORS 279C.570(2), unless the Contractor elects an alternative in lieu of cash retainage, such as bonds, securities or

other instruments, or a deposit of a surety bond. The Contractor must receive interest on the retained moneys from the date the Contractor's related payment request is fully approved by the City until the date the retained moneys are paid by the City to the Contractor. Payment of retainage is deemed to be "paid" when the payment is transmitted to the Contractor.

In consideration of the faithful performance of all of the obligations herein set out, and in consideration of the faithful performance of this Contract, the City agrees to pay to the Contractor the amount earned, as determined from the actual quantities of work performed and prices and other basis of payment specified, taking into consideration any amounts that may be deductible, under the terms of the Contract.

The Contractor agrees to complete the work within the time specified herein and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said proposal.

Said improvements must be completed by the date specified in said Contract Documents and if not so completed, unless said time for completion is extended, as provided in the Contract Documents, or if extended, if the same is not completed within the time extended, the City will be caused to incur liquidated damages as specified in the Contract Documents. Liquidated damages must be retained out of any monies due or to become due under this agreement.

Payments must be made as provided in the Contract Documents. Notwithstanding anything in this agreement to the contrary, the City's obligation to pay money beyond the current fiscal year shall be subject to and dependent upon appropriations being made from time to time by the City Council for such purpose; provided, however, that the City Manager or other officer charged with the responsibility for preparing the City's annual budget must include in the budget for each fiscal year the amount of the City financial obligation payable in such year and the city manager or such other officer must use his/her best efforts to obtain the annual appropriations required to authorize said payments.

The Parties acknowledge that the parties and their counsel have reviewed this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting Party shall not be employed in the interpretation of this Agreement or any exhibits or amendments hereto.

Should suit or action be undertaken to enforce any of the terms of this agreement or to seek damages for its breach, the prevailing party shall be entitled to an award of its reasonable attorney fees, costs, and expenses, including expert witness fees, incurred therein, and such costs and fees as may be required on appeal, including those incurred on appeal. Jurisdiction for litigation must be vested exclusively in the courts of Oregon, Oregon law must apply, and venue must lie in the Circuit Courts in and for Linn County, Oregon.

The date this Agreement is signed by the last party to sign it (as indicated by the date associated with that party's signature) will be deemed the date of this Agreement. If a party signs but fails to date a signature the date that the other party receives the signing party's signature will be deemed to be the date that the signing party signed this Agreement and the other party may inscribe that date as the date associated with the signing party's signature.

IN WITNESS WHEREOF, the undersigned duly authorized officials have caused this contract to be executed on behalf of their respective parties.

CONTRACTOR:

DATE: _____

By: _____
Title: _____

By: _____

Title: _____

(Note: Signatures of two officers are required for a corporation.)

_____
Construction Contractor's Board License Number

Tax Identification No.: _____
Telephone Number: ( ) _____

CITY OF MILLERSBURG, OREGON:

DATE: _____

By: _____
Kevin Kreitman, EFO, City Manager

Approved as to form:

By: _____
City Attorney

PERFORMANCE BOND

BOND NUMBER: _____

TOTAL BID AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS that we, _____, as CONTRACTOR (Principal), and _____, a corporation, duly authorized to do a general surety business in the State of Oregon as SURETY, are jointly and severally held and bound unto the City of Millersburg, Oregon, (Obligee) in the sum of (100% of Contract) _____ _____ Dollars ($_____) for the payment of which we jointly and severally bind ourselves, our heirs, executors, administrators, and assigns or successors and assigns firmly by these presents.

THE CONDITION OF THIS BOND IS SUCH that, whereas the principal has made and entered into a certain contract, a copy of which is attached hereto, with the City of Millersburg, Oregon, which contract, together with the applicable plans, Standard Specifications, Special Provisions, and schedule of contract prices, is by this reference made a part, whereby the principal agrees to perform in accordance with the certain terms, conditions, requirements, plans, and specifications which are set out in the contract and all authorized modifications of the contract which increase the amount of the work and the amount of the contract. Notice to the surety of any of the immediately foregoing are waived.

NOW, THEREFORE, if CONTRACTOR must faithfully and truly observe and comply with the terms, conditions, and provisions of the Contract, in all respects upon the terms set forth therein, and within the time prescribed therein and must indemnify and save harmless the City of Millersburg, Oregon, its officers, employees, and agents against losses and expenses and any damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the said Contract and must honor all claims for defective work within the warranty period(s) established by the *Standard Construction Specifications* and Special Provisions, after the acceptance of said Contract, then this obligation is to be void, otherwise to remain in full force and effect for the duration of the warranty period(s). The establishment and warranty periods for plantings must be two years as outlined in Section 107.15.02 of the *Standard Construction Specifications*. The warranty for all other work must be for a one-year period as outlined in Section 107.15.00.

PROVIDED, HOWEVER, that this bond is subject to the following further conditions:

a) Losses and expenses include but are not limited to attorney's fees to defend all claims, proceedings, lawsuits, and judgments arising out of or resulting from the fault of the principal, the principal's agents, representatives, or subcontractors, in the performance of or failure to perform this contract. However, principal must not be required to indemnify any indemnitee to the extent the damage, loss, or expense is caused by the indemnitee's negligence and must in all respects perform said contract according to law.

b) All material suppliers and all persons who must supply such laborers, mechanics, or subcontractors with material, supplies, or provisions for carrying on such work, must have a direct right of action against CONTRACTOR and SURETY on this bond, second only the right of the City of Millersburg, Oregon, under this bond, which right of action must be asserted in proceedings instituted in the name of the City of Millersburg, Oregon, to the use and benefit of the person, firm, or corporation instituting such action and all other persons, firms, or corporations having claims hereunder, must have the right to be made a party to such proceeding and to have such claim adjudicated in such action and judgment rendered thereon.

c) In no event shall SURETY be liable for a greater sum than the penalty of this Bond, or subject to any suit, action, or proceeding thereon that is instituted past the expiration of the warranty period(s) after the complete performance and acceptance of said Contract and final settlement thereof.

d) The said SURETY, for the value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligations of this bond; and it does hereby waive notice of any such

change, extension of time, alteration, or addition to the terms of the Contract, or to the work, or to the Contract Documents.

IN WITNESS THEREOF, the parties hereto have caused this bond to be executed this _____ day of _____ 2021.

_____
Principal

By:_____
Signature

_____
Print or Type

_____
Street/City Address

_____
Surety

By:_____
Signature

_____
Print or Type

_____
Street/City Address

_____
Telephone Number

Surety Witness:

By: _____

_____
Street/City Address

PAYMENT BOND

BOND NUMBER: _____

TOTAL BID AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS that we, _____, as CONTRACTOR (Principal), and _____, a corporation, duly authorized to do a general surety business in the State of Oregon as SURETY, are jointly and severally held and bound unto the City of Millersburg, Oregon, (Obligee) in the sum of (100% of Contract) _____ _____ Dollars ($_____) for the payment of which we jointly and severally bind ourselves, our heirs, executors, administrators, and assigns or successors and assigns firmly by these presents.

THE CONDITION OF THIS BOND IS SUCH that, whereas the principal has made and entered into a certain contract, a copy of which is attached hereto, with the City of Millersburg, Oregon, which contract, together with the applicable plans, Standard Specifications, Special Provisions, and schedule of contract prices, is by this reference made a part, whereby the principal agrees to perform in accordance with the certain terms, conditions, requirements, plans, and specifications which are set out in the contract and all authorized modifications of the contract which increase the amount of the work and the amount of the contract. Notice to the surety of any of the immediately foregoing are waived.

NOW, THEREFORE, if CONTRACTOR must make payment promptly, as due to all subcontractors and to all persons supplying to the Contractor or its subcontractors, equipment, supplies, labor, or materials for the prosecution of the work, or any part thereof, provided for in said contract; and must in performing the contract pay and cause to be paid not less than the State of Oregon Bureau of Labor and Industries (BOLI) prevailing wage rates in effect as of the date of the bid advertisement by City of Millersburg, Oregon, unless the amount of the contract is $50,000 or less, in which case the prevailing wage rate requirement shall not apply; and pay per hour, day, and week for and to each and every worker who may be employed in and about the performance of the contract; and pay all contributions or amounts due to the State Accident Insurance Fund and the State Unemployment Trust Fund from such Contractor or subcontractors; and pay all sums of money withheld from the Contractor's employees and payable to the State Department of Revenue; and must pay all other just debts, dues, and demands incurred in the performance of the said contract; and must pay the City of Millersburg, Oregon such damages as may accrue to the City of Millersburg, Oregon, under the contract, then this obligation is to be void, otherwise to remain in full force and effect, provided that surety will remain liable to satisfy the claim of any worker affected by the failure of the principal or any subcontractor under the contract to pay the minimum rate of wage in accordance with the contract in the amount of minimum wages and an additional amount equal thereto as liquidated damages.

a) All material suppliers and all persons who shall supply such laborers, mechanics, or subcontractors with material, supplies, or provisions for carrying on such work, shall have a direct right of action against CONTRACTOR and SURETY on this bond, second only the right of the City of Millersburg, Oregon, under this bond, which right of action must be asserted in proceedings instituted in the name of the City of Millersburg, Oregon, to the use and benefit of the person, firm, or corporation instituting such action and all other persons, firms, or corporations having claims hereunder, must have the right to be made a party to such proceeding and to have such claim adjudicated in such action and judgment rendered thereon.

b) The said SURETY, for the value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligations of this bond; and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract, or to the work, or to the Contract Documents.

IN WITNESS THEREOF, the parties hereto have caused this bond to be executed this _____ day of _____ 2021.

_____
Principal

By:_____
Signature

_____
Print or Type

_____
Street/City Address

_____
Surety

By:_____
Signature

_____
Print or Type

_____
Street/City Address

_____
Telephone Number

Surety Witness:

By: _____

_____
Street/City Address

RETAINAGE ELECTION

In accordance with ORS 279C.570(2) and OAR 137-049-0820, contracts that exceed $500,000 require the City to deposit amounts withheld as retainage into an interest-bearing escrow account in a bank, savings bank, trust company, or savings association. Retainage in the amount of five percent (5%) of the contract price of the work completed will be held by the City until such time as the project has been completed and accepted by the City.

Oregon law allows specific alternatives for the holding and accounting of retainage at the Contractor's election. If the City incurs additional costs as a result of the Contractor's election, the City may recover such costs from the Contractor, ORS 279C.560(3). Failure to execute and submit this form prior to execution of the contract agreement will result in the automatic selection of the first option. **Contractor must select one of the following options in providing for retainage for this project.**

☐ **1. Interest-bearing escrow account.**

The City will set up an interest-bearing account in a bank, savings bank, trust company, or savings association in the name of the City of Millersburg. The City will make deposits of retainage withheld from each progress payment into the interest-bearing escrow account. Funds in the escrow account will be released to the Contractor within 30 days of final acceptance of the project by the City.

Contractor must execute documentation and instructions to establish the interest-bearing escrow account prior to contract execution. Interest earned on the account shall accrue to the Contractor. Amounts retained and interest earned will be included in the final payment and may be offset by costs incurred. Contractor shall receive interest from the date the Contractor's related payment request is fully approved by the City until the date the retained moneys are paid by the City to the Contractor. Retainage is deemed to be paid when the payment is transmitted to the Contractor.

☐ **2. Deposit of bonds, securities, and other instruments.**

No later than the Contractor's execution of the contract, the Contractor will deposit acceptable bonds or securities, in an amount equivalent to five percent retainage of the contract amount, with the City or with a bank or trust company in Oregon. The bank or trust company will provide a safekeeping receipt to the City. The securities must cover all of the retainage.

Name of Lending Institution: _____

Acceptable bonds and securities to be held in lieu of retainage:

a. Bills, certificates, notes, bonds or other obligations of the United States, its agencies or its wholly-owned corporations.
b. Indebtedness of the Federal National Mortgage Association.
c. General obligation bonds of the State of Oregon or a political subdivision of the State of Oregon.
d. Irrevocable letters of credit issued by an insured institution, defined in ORS 706.008.

☐ 3. **Deposit of a retainage surety bond.**

The Contractor may, with approval of the City, deposit a surety bond for the benefit of the City, in a form acceptable to the City, in lieu of the five percent retainage. The bond should be received from the same surety providing the performance and payment bonds for the project.

Name of Surety/Lending Institution: _____

Therefore, by signing this retainage election the Bidder does hereby certify and confirm that as the general contractor for this City of Millersburg project, they have elected the above retainage option which satisfies the intent of the above-referenced legislation.

CONTRACTOR: _____ Project # 2020-01

TITLE/SIGNATURE: _____ Date: _____

SPECIAL PROVISIONS

SECTION I: GENERAL REQUIREMENTS AND TECHNICAL SPECIFICATIONS

I-1. DESCRIPTION OF WORK

This project includes construction of a new 10,200 SF new fire station, including site work and construction of new public street.

Construction must be in conformance with the current edition of the City of Albany *Standard Construction Specifications*, the Project Manuals, Construction Drawings, and these Special Provisions. In situations where specification requirements differ, the more stringent requirement will apply.

I-2. ENTITIES

The Owner (hereinafter referred to as Owner, OWNER, or City):
City of Millersburg
Address:
4222 NE Old Salem Road
Albany, OR 97321

The Architect (hereinafter referred to as Architect or ARCHITECT):
Soderstrom Architects
Address:
1200 NW Naito Parkway, Suite 410
Portland, Oregon 97209

I-3. SITE CONDITIONS

The site is a greenfield site, currently in agricultural use.

I-4. BIDDING SCHEDULE

The City reserves the right to alter the schedule below at any time (regardless of the written addenda deadline) by notice to all those on the Planholders list:

Issue Invitation to Bid	February 3, 2021
Cut Off for Addendum 1 Questions	February 19, 2021
Addendum 1 Release	February 23, 2021
Mandatory Pre-Bid Conference	February 23, 2021, 10:00 a.m.
Optional Pre-Bid Site Visit	February 24, 2021, 10:00 a.m.
Cut Off for Addendum 2 Questions	February 26, 2021
Addendum 2 Release	March 2, 2021
Bid Due Date	March 9, 2021, 2:00 p.m.
City Council Award	March 15, 2021
Notice of Intent to Award	March 16, 2021, 2:00 p.m.
Protest Period Ends	March 23, 2021, 2:00 p.m.
Notice of Award	March 23, 2021

I-5. MANDATORY PREDBID MEETING

A mandatory pre-bid meeting will be held on **Tuesday, February 23, 2021, at 10:00 a.m.** This will be a virtual hosted meeting, https://aspenuc.accessionmeeting.com/j/1164107829. Bidders can also dial in using their phones (1-503-212-9900, access code 116-410-7829). A representative must be present and sign in for the meeting. An optional site visit will be conducted on **Wednesday, February 24, 2021 at 10:00 a.m. Face coverings will be required for the entirety of the site visit.**

Failure to become acquainted with the physical conditions of the project will not relieve the Contractor from the responsibility of properly estimating the difficulty or cost of successfully performing the work. The contractor

warrants, as a result of examination and investigation of all data, the work can be performed in a good, workmanlike manner to the satisfaction of the City.

I-6. STANDARD CONSTRUCTION SPECIFICATIONS

Each bidder must have access to a current set of City of Albany *Standard Construction Specifications*, which can be found on the City of Albany's website at http://www.cityofalbany.net/standard-construction-specifications or a printed set may be purchased for $100. All public improvements are required to conform to these specifications and bid prices must reflect these specifications.

I-7. AWARD OF CONTRACT

The Contract, if awarded, will be awarded based on the best value to the City of Millersburg, determined by the City of Millersburg in accordance with the scoring described below, at the City's sole and absolute judgment to best serve its interest.

A committee will be appointed to evaluate the submittals received, using the evaluation criteria indicated below.

Each submittal will be judged on a combination of price and qualifications. Qualifications must demonstrate the firm has the necessary experience and resources to complete the project on time and within budget, in an efficient and cost-effective manner to the City. The City reserves the right to request clarification and/or additional information of the top three ranked bidders.

Evaluation factors and the maximum points to be awarded will be as follows:

A. Bid Price (Weight: 40). The lowest total bid amount of either Schedule A or Schedule A plus any, all, or none of the additive alternate bid items in Schedule B.

B. Contractor's Qualification Statement (Weight 60). Completed AIA Document A305 - 2020 forms, provided in Appendix C. Forms shall include:

Exhibit A – General Information

Exhibit B – Financial and Performance Information

Exhibit C – Project Specific Information

Exhibit D – Past Project Experience

Exhibit E – Past Project Experience (Continued)

The City reserves the right to postpone the acceptance of the proposal and the award of the contract to a responsible bidder for a period not to exceed sixty (60) calendar days, or to reject any and all proposals received and further advertise the project for bids. The City may reject any bids not in compliance with all prescribed public contracting procedures and requirements, including the requirement to demonstrate the bidder's responsibility under ORS 279C.375(3)(b), and may reject for good cause any or all bids upon a finding of the City it is in the public interest to do so. The City of Millersburg may to the maximum extent allowed by law, waive bid irregularities or strict compliance with any requirement herein if it concludes such action to be in its best interest.

List of Subcontractors. Contractor is required to submit a list of subcontractors in accordance with ORS 279C.370. The City will submit a copy of this disclosure of first-tier subcontractors to the Bureau of Labor and Industries (BOLI) along with the completed BOLI form WH-81.

Failure to submit the list of subcontractors form by the disclosure deadline will result in a nonresponsive bid. A nonresponsive bid will not be considered for award. If no subcontractors need to be disclosed, this form must still be submitted indicating such.

Electronic Signature. Any signature (including any electronic symbol or process attached to, or associated with, a contract or other record and adopted by a Person with the intent to sign, authenticate, or accept such contract or record) hereto or to any other certificate, agreement or document related to this transaction, and any contract formation or record-keeping through electronic means shall have the same legal validity and enforceability as a manually executed signature or use of a paper-based recordkeeping system to the fullest extent permitted by applicable law.

Communicable Diseases. Contractor understands the risk to have contact with individuals, who have been exposed to and/or have been diagnosed with one or more communicable diseases, including but not limited to COVID-19 or other medical conditions, diseases, or maladies that exist, and it is impossible to eliminate the risk that Contractor could be exposed to and/or become infected through contact with or close proximity with an individual with a communicable disease. CONTRACTOR KNOWINGLY AND FREELY ASSUMES ALL SUCH RISKS, both known and unknown, EVEN IF ARISING FROM THE NEGLIGENCE OF THE RELEASEES OR OTHERS, and assumes all full responsibility for Contractor's participation.

I-8. CONTRACT COMPLETION TIME AND LIQUIDATED DAMAGES

At the Contractor's option, the City will issue the Notice to Proceed any time after both parties have executed the contract, but no earlier than April 6, 2021. The Contractor is required to give the City seven days advance notice of intent to begin construction.

Regardless of the actual construction start date, all work specified in the contract documents must be completed, in every respect, by May 31, 2022, the ultimate completion date.

Liquidated damages will be assessed against the Contractor for each day beyond the stated ultimate completion date until the work is satisfactorily completed and accepted by the City. The schedule of liquidated damages is listed in the *Standard Construction Specifications*, Section 108.06.00.

I-9. WORKING HOURS

Working hours shall be 7:00 a.m. to 10:00 p.m. Work outside of these hours requires prior approval.

I-10. PRECONSTRUCTION CONFERENCE

A preconstruction meeting will be required. The meeting will be scheduled to take place a minimum of one week prior to beginning of construction. The Contractor must submit the following submittals at the preconstruction conference:

- Project Schedule
- Traffic Control Plan
- Breakdown of Contract Prices

I-11. PROJECT SCHEDULE

A detailed construction schedule of all work relating to this project must be submitted to the Architect and Owner at the preconstruction conference. The schedule must show how the contractor plans to complete the project on or before the ultimate completion date. The Contractor must take appropriate measures to expedite work items that are behind schedule, including the use of outside forces to complete the work, without additional compensation. For additional scheduling requirements see Project Manual Specification Section 01 3216.

I-12. TEMPORARY TRAFFIC CONTROL

All temporary traffic control must be in accordance with the current edition of the *Manual on Uniform Traffic Control Devices* (MUTCD); the ODOT *Short-Term Traffic Control Handbook*; City of Albany *Standard Construction Specifications*, Section 202; and as stated herein. The Contractor must provide traffic control devices as may be required at locations where construction is of short-term duration (i.e., street intersections and access to private property), as well as traffic control devices that are expected to be in place for the duration of the project.

Construction operations must be conducted in a manner that will provide for uninterrupted movement of traffic on all public and private roadways within the construction area. At a minimum, the Contractor must maintain one lane of traffic in each direction or provide flaggers to control alternating traffic through a single lane. Temporary ramps must be installed and maintained at intersections and driveways for the duration of the project. At no time will the flow of traffic be stopped completely without the approval of the Engineer. Approval for short-term, temporary closures or detours, if given, will be limited to a specific instance and will not be approved as standard practice.

The Contractor must limit all construction traffic, including material delivery and spoil removal, to those streets where there are construction activities taking place. The City will immediately suspend work in the event that the

Contractor does not limit construction traffic to approved streets. Work will be allowed to resume only after the Contractor has submitted a construction traffic routing plan limiting construction traffic to approved streets. This plan will be reviewed and approved by the City prior to its implementation. Damage to streets resulting from unapproved construction traffic must be corrected by the Contractor at no expense to the City.

The Contractor must submit traffic control plans to the Architect and Owner for review one week prior to commencing construction. The traffic control plan must include a description of the traffic control devices, signing, and flaggers that are to be provided. Work must not begin until the City approves the traffic control plans. Following approval, the plan must be adhered to at all times.

Construction operations must not commence until all construction signing is in place. Construction signing required for the project must be furnished and maintained by the Contractor.

No work within the Old Salem Road right-of-way shall take place without a valid encroachment permit from Linn County. No closures of Old Salem Road shall be allowed without prior approval of Linn County. After working hours, construction equipment may not be parked within the Old Salem Road right-of-way.

In the event the Contractor fails to provide and maintain proper barricades, signs, and other traffic control devices within one hour after notification by the Architect or Owner, the City may install the traffic control devices at the Contractor's expense. The City will deduct two times (200 percent) the City's actual cost, which will include all labor, equipment, and materials involved, from any payments due or coming due to the Contractor.

I-13. ENTERING AND WORKING WITHIN CONFINED SPACES

Contractors working on any public improvement project, while under contract with the City or a private entity, must comply with the following regulations as they pertain to entering and working within confined spaces (as defined by OR-OSHA):

1. Identify any confined space entry that is required to perform the work and submit a list of the locations to the City.
2. Submit a procedure that meets or exceeds OR-OSHA confined space entry regulations.
3. Submit written notice to the City of any hazardous situation that is encountered during the entry of or while working within a confined space.

I-14. COMPETENT PERSON DESIGNATION

The Contractor will designate a qualified and experienced "competent person" on site at all times during construction whose duties and responsibilities will include enforcement of applicable OSHA regulations regarding excavations, the prevention of accidents, and the maintenance and supervision of construction site safety precautions and programs.

I-15. BREAKDOWN OF CONTRACT PRICES

A detailed breakdown of contract pricing must be submitted to the Architect and Owner at the preconstruction conference. The breakdown of all lump sum bid items must show the value assigned to each part of the work, including an allowance for profit and overhead adding up to the total lump sum contract price. Breakdown of lump sum items will be coordinated with the items in the schedule and will be in sufficient detail to serve as the basis for progress payments during construction. The Architect and Owner will review the contract price breakdown and may request items to be further broken down or for more items to be added in order to facilitate tracking of work progress for payment. Upon acceptance of the breakdown of the contract price by the Engineer, it will be used as the basis for all requests and payments.

I-16. NOTIFICATIONS

The Contractor must provide written notice to the front office of the following agencies, three (3) working days in advance of beginning construction. The written notice must include the construction schedule and must explain the extent and duration of expected traffic disruptions. Agency contact information may be found in the table below.

Agency	Address	Phone Number
Republic Services	1214 Montgomery Street SE Albany, OR 97321	541-928-2551
Albany Fire Department Administrative Office	611 Lyon Street SE Albany, OR 97321	541-917-7700
Linn County Road Department	3010 Ferry Street SW Albany, OR 97322	541-967-3919
Linn County 911 Center	1115 Jackson Street SE Albany, OR 97322	541-967-3950

The Contractor must notify the above-named agencies and the public of any schedule changes that are made by the Contractor, required by the City, or are the result of weather or other unforeseen circumstance. The Contractor must submit a copy of each notification to the City for review and approval prior to delivering the notices.

The Contractor must provide written notification to all affected residents and businesses three working days in advance of scheduled work that will result in traffic disruptions and blocked access to driveways or parking areas. Written notifications must explain the extent and duration of the disruption of traffic and/or blocked access and must include alternate routes or parking areas as appropriate.

I-17. LINN COUNTY ENCROACHMENT PERMIT

The City will secure the required Linn County encroachment permit for work within the Old Salem Road right-of-way. The Contractor shall comply with all conditions set forth in the permit.

Construction of the project shall be in compliance with the permit conditions. In situations where permit requirements differ from those contained in the City of Albany Standard Specifications, Special Provisions, and the construction drawings, the more stringent requirement will apply.

I-18. WORK AROUND FIBER OPTIC LINES

The Contractor shall give fiber providers (Century Link, LS Networks, Level 3, others if applicable) 48-hours advance notice of each instance where construction will occur in the vicinity of fiber optic lines. It shall be the Contractor's responsibility to comply with all fiber provider-imposed requirements to protect the fiber optic lines during construction operations. Fiber provides may require that their lines be excavated by hand to minimize the risk of damage. Fiber providers may want their own inspector on-site during construction in these areas.

I-19. "OR EQUAL" CAUSE

In order to establish a basis of quality, certain processes, types of machinery and equipment or kinds of material may be specified on the drawings or herein by designating a manufacturer's name and referring to its brand or product designation. It is not the intent of these specifications to exclude other processes, equipment or materials of a type and quality equal to those designated. When a manufacturer's name, brand, or item designation is given, it will be understood that the words "or equal" follow such name or designation, whether in fact they do so or not. If the Contractor desires to furnish items of equipment by manufacturers other than those specified, they will secure the approval of the Architect and Owner prior to placing a purchase order.

No extras will be allowed to the Contractor for any changes required to adopt the substitute equipment. Therefore, the Contractor's proposal for an alternate will include all costs for any modifications to the drawings, such as structural and foundation changes, additional piping or changes in piping, electrical changes or any other modifications which may be necessary or required for approval and adoption of the proposed alternate equipment. Approval of alternate equipment by the Architect or Owner before or after bidding does not guarantee or imply that the alternate equipment will fit the design without modifications.

I-20. LOCATION OF UTILITIES

The Contractor must determine the horizontal and vertical alignment of existing public and private utilities well enough in advance to make adjustments to the work. Locating utilities ahead of construction and providing protective measures where required are incidental to other bid items.

I-21. PROTECTION OF EXISTING STRUCTURES AND WORK

The Contractor must take all precautions and measures necessary to protect all existing structures and work. City-owned, infrastructure damaged during construction must be repaired as directed by the Owner. All completed repair work will require approval of the Owner prior to covering the work.

I-22. EXCAVATION AND BACKFILL REQUIREMENTS

A fill permit will be required to deposit excavated materials, in excess of 50 cubic yards at any one tax lot, from this project regardless of whether the site is publicly or privately owned. For property located within the city limits, fill permits may be obtained from City Hall, 4222 Old Salem Road NE, Albany, Oregon. For property located outside the city limits, fill permits may be obtained from the Linn County Building Department at the Linn County Court House, Fourth Avenue and Ellsworth Street, Albany, Oregon.

I-23. CONNECTION TO EXISTING WATER LINES

The Contractor shall be responsible for scheduling and conducting exploratory excavations as necessary to determine material requirements for work involving connections to existing water lines. The outside diameter of existing water lines may vary from industry standard specifications (where available) or from information provided on the plans. The Contractor shall be solely responsible for excavating each specific location where there is work involving an existing water line and to determine the actual pipe type and diameter before ordering materials. The City will not compensate the Contractor for components that are found to be incompatible with existing materials. Potholing connections to existing water lines is considered incidental to other bid items.

Existing abandoned water lines or other utilities shall not be used as permanent bracing or as backing for permanent concrete thrust restraint where mechanical restraint is not appropriate. The use of concrete thrust restraint where mechanical restraint is specified will require the approval of the Owner.

I-24. MAINTAINING SEWER FLOWS

The Contractor shall maintain sewer flows in the existing system. The sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system or transported in equipment designed for that purpose to an approved disposal site. Transporting and disposal of sewage shall be in conformance with applicable state and local regulations. Sewage shall not be discharged into, or allowed to flow in storm drains, trenches, creeks, rivers, ditches, or similar drainage ways. Sewage spills or accumulations shall be cleaned up promptly. The Contractor shall be responsible for notifying the Owner and DEQ immediately of any sewer spills.

Under no circumstances shall sewage be allowed to overflow from manholes, flood basements, make building sewers inoperable (i.e., with back water valve), or cause any damage to the sewer system due to surcharging.

When pumping and bypassing is required, the Contractor shall furnish, install, and operate the pumps, conduits, and other equipment to divert the flow of sewage around the section in which work is to be performed. A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. At the end of each day, flow shall be restored to normal. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypass system. Pumping shall be done in a manner that will not damage public or private property, or create a nuisance or health menace. No overnight pumping will be allowed.

I-25. WATER SUPPLY

The City will provide water required for the completion of the work. The Contractor must only take water from approved fire hydrants as designated by the City.

I-26. FIELD OFFICE

The City will provide access to a City-owned house located onsite for use as Field Office during the course of the project. Plumbing fixtures are provided, but house does not currently have water service. Contractor will be responsible for connecting new water service to the house.

I-27. FIELD WORK WINDOW

The City leases adjacent agricultural property for farming. Construction of sewer and storm drain lines outside main project footprint area must be coordinated with City's lessee. Contractor shall schedule this work to occur in August and/or September, following removal of the crop and prior to planting of the next season's crop. Coordinate exact dates with owner.

SECTION II: STATE AND FEDERAL CONTRACTING LAW

II-1. PREVAILING WAGES

All the provisions required by ORS 279C.800 through ORS 279C.870 relating to the payment of prevailing wage rates for work performed under the Contract with the City of Millersburg must be complied with.

Each worker in each trade or occupation employed in the performance of this contract either by the contractor, subcontractor, or other person doing or contracting to do, or contracting for the whole or any part of the work on this contract, must be paid not less than the applicable state prevailing rate of wage, or the applicable federal prevailing rate of wage, whichever is higher.

Oregon law requires that the higher of the state prevailing wage rates (PWR) or federal Davis-Bacon rates be paid to workers on projects subject to both the state PWR law and federal Davis-Bacon Act.

City of Millersburg Fire Station does not use federal funds and does not require Davis-Bacon rates. Only Oregon BOLI Prevailing Wage Rates apply to this project.

Each year the Oregon Bureau of Labor and Industries (BOLI) publishes rates and amendments that are available by calling 971-673-0839 or online at the BOLI website at:

https://www.oregon.gov/boli/employers/Pages/prevailing-wage-rates.aspx

The publication that applies to this contract is the July 1, 2020, Prevailing Wage Rates for Public Works Contracts in Oregon, along with the October 1, 2020, Amendment.

Daily/weekly/holiday/weekend overtime must be paid. If a contractor fails to pay for any labor or services, the City can pay for this labor or services and withhold these amounts from payments due the contractor. ORS 279C.520; OAR 839-025-0020(2)(b).

Contractors and subcontractors are required to prepare weekly certified payroll reports and statements and submit them to the City by the fifth business day of each month (ORS 279C.845; OAR 839-025-0010). Contractor payment will be withheld until the City is in receipt of these certified weekly payroll reports. Information submitted on certified statements may be used only to ensure compliance with the provisions of ORS 279C.800 through ORS 279C.870.

II-2. PERFORMANCE, PAYMENT, AND PUBLIC WORKS BONDS

In addition to the required payment bond and performance bond, unless exempt under ORS 279C.836 (7), (8), or (9), the contractor is required to file a $30,000 Public Works Bond with the Construction Contractor's Board to be used exclusively for unpaid wages determined to be due by BOLI. The general contractor is required to verify that subcontractors, unless exempt, have filed a public works bond before permitting a subcontractor to start work on a project.

The Statutory Public Works Bond form is available from BOLI upon request or may be downloaded from http://www.oregon.gov/BOLI/WHD/pages/index.aspx.

II-3. RECIPROCAL PREFERENCE LAW

Oregon's reciprocal preference law, ORS 279A.120 and ORS 279A.125, requires public contracting agencies, in determining the lowest responsible bidder, to add a percent increase to each out-of-state bidder's bid price that is equal to the percent of preference given to local bidders in the bidder's home state. That is, if the low bidder is from a state that grants a 10 percent preference to its own in-state bidders, the Oregon agency must add 10 percent to that bidder's price when evaluating the bid.

For details, check Oregon's Reciprocal Preference Law website at:

https://www.naspo.org/reciprocity1

Bidders in need of any assistance in the application of this law should call the State Procurement Office at 503-378-4642, or contact them at State of Oregon - Department of Administrative Services, State Procurement Office, 1225 Ferry Street SE, U-140, Salem, OR 97301-4285.

II.4. AFFIRMATIVE ACTION/NONDISCRIMINATION

By submitting a bid, the Bidder agrees to comply with the Fair Labor Standards Act (FLSA); Title VII of the Civil Rights Act of 1964; Executive Order 11246, (as amended); Fair Employment Practices; Equal Employment Opportunity Act; Section 503 of the Rehabilitation Act of 1973, as amended; Vietnam Era Veterans' Readjustment Assistance Act of 1974; Americans with Disabilities Act; Age Discrimination in Employment Act of 1967 (ADEA); and Oregon Revised Statutes (ORS). By submitting a bid, the Bidder specifically certifies, under penalty of perjury, that the Bidder has not discriminated against minority, women, or emerging small business enterprises in obtaining any required subcontracts.

If the contract is awarded on the basis of the contractor's certification as a Disadvantaged Business Enterprise (DBE), Minority/Women Business Enterprise (MWBE) and Emerging Small Business (ESB) certifications (collectively known as MWESBs), the contractor must remain certified during the entire term of the contract. Contractors must include a similar provision in any subcontracts for the project.

II-5. PAY EQUITY COMPLIANCE AND TRAINING CERTIFICATION

Pay Equity Compliance. As required by ORS 279C.520, Contractor must comply with ORS 652.220 and ORS 659A, and must not unlawfully discriminate against any of contractor's employees in the payment of wages or other compensation for work of comparable character on the basis of an employee's membership in a protected class. Contractor's compliance with this section constitutes a material element of this Agreement and a failure to comply constitutes a breach that entitles the City to terminate this Agreement for cause. Contracts valued at $500,000 with employers that have 50 or more employees are required to take Pay Equity Training and submit a certificate as proof before awarded a contract. Contractor certifies they have taken the required Pay Equity Training and have provided a certificate to the City.

Free training is available through the state of Oregon's Department of Administrative Services. Details are available at https://www.oregon.gov/das/Procurement/Pages/PayEquity.aspx.

II-6. LICENSE REQUIRED FOR ASBESTOS ABATEMENT PROJECT

This contract does not require the contractor or subcontractor to be licensed under ORS 468A.720, regarding asbestos abatement.

II-7. CONSTRUCTION AND DEMOLITION DEBRIS/YARD WASTE MATERIALS – ORS 279C.510

The contractor is responsible for:

1. Salvaging or recycling construction and demolition debris, if feasible and cost-effective.
2. Composting or mulching yard waste material at an approved site, if feasible and cost-effective.

II-8. PROVISIONS CONCERNING ENVIRONMENTAL AND NATURAL RESOURCES LAWS

Contractor is responsible to abide by ORS 279C.525 regarding enacted ordinances, rules, or regulations as set forth by the Millersburg Municipal Code, Oregon Department of Environmental Quality, Department of State Lands, Environmental Protection Agency, and/or the US Army Corps of Engineers, or any other federal, state, and local agency, in regards to the prevention of environmental pollution and preservation of natural resources.

II-9. PAYMENT, CONTRIBUTIONS, LIENS, WITHHOLDING – ORS 279C.505

The contractor shall:

1. Make payment promptly, as due, to all persons supplying to the contractor labor or material for the performance of the work provided for in this contract.
2. Pay all contributions or amounts due the Industrial Accident Fund from the contractor or subcontractor incurred in the performance of the contract.
3. Not permit any lien or claim to be filed or prosecuted against the City on account of any labor or material furnished.
4. Pay to the Department of Revenue all sums withheld from employees under ORS 316.167.

II.10. PAYMENT OF CLAIMS BY PUBLIC OFFICERS, PAYMENT TO PERSONS FURNISHING LABOR OR MATERIALS AND COMPLAINTS – ORS 279C.515; OAR 839-025-0020(2)(a)

1. If the Contractor fails, neglects, or refuses to pay promptly a person's claim for labor or services that the person provides to the Contractor or a subcontractor in connection with this contract as the claim becomes due, the City may pay the amount of the claim to the person that provides the labor or services and charge the amount of the payment against funds due or to become due the Contractor by reason of this contract.
2. If the Contractor or a first-tier subcontractor fails, neglects, or refuses to pay a person that provides labor or materials in connection with this contract within 30 days after receiving payment from the City or Contractor, the Contractor or first-tier subcontractor owes the person the amount due plus interest charges that begin at the end of the 10-day period within which payment is due under ORS 279C.580 (4) and that end upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest on the amount due is nine percent per annum. The amount of interest may not be waived.
3. If the Contractor or a subcontractor fails, neglects, or refuses to pay a person that provides labor or materials in connection with the public improvement contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580.

II-11. CONTRACTOR'S RELATIONS WITH SUBCONTRACTORS – ORS 279C.580(3)(4)

Contractor is required to include in each subcontract for property or services the contractor enters into with a first-tier subcontractor, including a material supplier, for the purpose of performing a construction contract:

1. A payment clause that obligates the contractor to pay the first-tier subcontractor for satisfactory performance under the subcontract within 10 days out of amounts the City pays to the contractor under this contract.
2. A clause that requires the contractor to provide a first-tier subcontractor with a standard form that the first-tier subcontractor may use as an application for payment or as another method by which the subcontractor may claim a payment due from the contractor.
3. A clause that requires the contractor, except as otherwise provided in this paragraph, to use the same form and regular administrative procedures for processing payments during the entire term of the subcontract. A contractor may change the form or the regular administrative procedures the contractor uses for processing payments if the contractor:
   a. Notifies the subcontractor in writing at least 45 days before the date on which the contractor makes the change; and
   b. Includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.
4. An interest penalty clause obligating the Contractor, if the contractor does not pay the first-tier subcontractor within 30 days after receiving payment from the City, to pay the first-tier subcontractor an interest penalty on amounts due in each payment the Contractor does not make in accordance with the payment clause included in the subcontract under paragraph (1.) above. A contractor or first-tier subcontractor is not obligated to pay an interest penalty if the only reason that the contractor or first-tier subcontractor did not make payment when payment was due is that the contractor or first-tier subcontractor did not receive payment from the City or Contractor when payment was due. The interest penalty applies to the period that begins on the day after the required payment date and that ends on the date on which the amount due is paid and is computed at the rate specified in ORS 279C.515(2).
5. A clause must be included in each of the Contractor's subcontracts requiring the first-tier subcontractor to include a payment clause and an interest penalty clause that conforms to the standards of this sub-section, paragraphs 1-4 above, in each of the first-tier subcontractor's subcontracts and to require each of the first-tier subcontractor's subcontractors to include such clauses in the first-tier subcontractors' subcontracts with each lower-tier subcontractor or supplier.
6. A mandate that all subcontractors, if they were awarded a subcontract on the basis of certification as a disadvantaged, minority-owned, women-owned, or emerging small business enterprise, to maintain certification through the term of the contract.

II.12. CONDITION CONCERNING HOURS OF LABOR – ORS 279C.520

Any worker employed by the Contractor may not be employed for more than 10 hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or when the public policy absolutely requires it, the employee must be paid at least time and a half pay as follows:

1. For all overtime in excess of eight hours in any one day or 40 hours in any one week when the work week is five consecutive days, Monday through Friday; or for all overtime in excess of 10 hours in any one day or 40 hours in any one week when the work week is four consecutive days, Monday through Friday; and
2. For all work performed on Saturday and on any legal holiday specified in ORS 279C.540.

Contractor must give notice in writing to employees, who work on a public contract, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, of the number of hours per day and days per week that the employees may be required to work.

Contractor must comply with the prohibition set forth is ORS 652.220, that compliance is a material element of the contract and that a failure to comply is a breach that entitles the contracting agency to terminate the contract for cause.

Contractor may not prohibit any of its employees from discussing the employee's rate of wage, salary, benefits, or other compensation with another employee or another person and may not retaliate against an employee who discusses the employee's rate of wage, salary, benefits, or other compensation with another employee or person.

II-13. TIME LIMITATION ON CLAIM FOR OVERTIME – ORS 279C.545

Any worker employed by the Contractor shall be foreclosed from the right to collect for any overtime provided in ORS 279C.540 unless a claim for payment is filed with the Contractor within 90 days from the completion of the contract, providing the contractor has:

1. Caused a circular clearly printed in boldfaced 12-point type and containing a copy of ORS 279C.545 to be posted in a prominent place alongside the door of the timekeeper's office or in a similar place that is readily available and freely visible to workers employed on the work; and
2. Maintained the circular continuously posted from the inception to the completion of the contract on which workers are or have been employed.

II-14. CONDITION CONCERNING PAYMENT OF MEDICAL CARE AND PROVIDING WORKERS' COMPENSATION – ORS 279C.530

1. Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical, and hospital care services or other needed care and attention, incident to sickness or injury, to the employees of the contractor, of all sums that the contractor agrees to pay for the services and all moneys and sums that the contractor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the services.
2. All subject employers working under this Contract must comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor must ensure that each of its subcontractors complies with these requirements.

SECTION III: TECHNICAL SPECIFICATIONS – BID ITEMS

SCHEDULE A: FIRE STATION 15

Item No. A1 – Construct Fire Station 15:
This bid item includes all equipment, labor, materials, and incidentals required to construct the new occupied and functioning fire station as shown on the Construction Drawings and as described in the Contract Documents, Specifications, and all documents referenced therein.

Payment for this bid item will be on a lump-sum basis and will include all equipment, labor, materials, and incidentals required to complete the work.

Item No. A2 – Construct Fire Station 15 Public Street Improvements:
This bid item includes all equipment, labor, materials, and incidentals required to construct improvements located within new road right-of-way as described in the Project Manual (Appendix B) and shown on sheets C2.30 through C3.50 (Appendix A).

Payment for this bid item will be on a lump-sum basis and will include all equipment, labor, materials, and incidentals required to complete the work.

SCHEDULE B: BID ALTERNATES

Item No. B1 – Bi-Fold Doors:
This item includes all equipment, labor, materials, and incidentals required to install three bi-fold doors in place of three overhead doors located on the south face of the building.

Payment for this bid alternate item will be on a lump-sum basis and will include all equipment, labor, materials, and incidentals required to complete the work.

Item No. B2 – Wood Ceilings:
The item includes all equipment, labor, materials, and incidentals required to install ceiling materials in areas indicated to receive wood ceiling.

- Base bid: provide Armstrong Woodworks Vector wood ceiling system at areas indicated to receive wood ceiling
- Alternate B2a: Provide 1x6 tongue and grove boards, clear stained, attached to 1/2" plywood substrate at areas indicated to receive wood ceiling
- Alternate B2b: Provide gypsum board ceiling at areas indicated to receive wood ceiling

SECTION IV: TECHNINCAL SPECIFCATIONS – CONTRACT ITEMS

1. PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS
   - A. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
   - B. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.
   - C. Submit substitution requests by completing the form in Section 00 4325 - Substitution Request Form - During Procurement; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
   - D. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders. Bidders shall not rely upon approvals made in any other manner.
   - E. The submission shall provide sufficient information to determine acceptability of such products, including the drawings, performance and test data, and other information necessary any evaluation.
   - F. Provide complete information on required revisions to other work to accommodate each proposed substitution.
   - G. Provide products as specified unless substitutions are submitted in this manner and accepted.
   - H. The burden of proof of the merit of the proposed substitution is upon the proposer.
   - I. Architect's decision of approval or disapproval of a proposed substitution shall be final.
   - J. No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents
   - K. The bidder shall advise the Architect during the bidding period if any specific materials shown or specified are not readily available or critical to the construction period and alternates shall be reviewed during this period.
   - L. See Section 01 6000 - Product Requirements for additional requirements.

2. EVIDENCE OF QUALIFICATIONS
   - A. To demonstrate qualification for performing the Work of this Contract, bidders ARE REQUIRED to submit AIA A305.

3. PRECEDENCE OF CONTRACT DOCUMENTS

   The provisions of this section shall modify Section 104.01.01 of the *Standard Construction Specifications*.
   - A. In the case of conflict, the order of precedence of the following documents in controlling the work shall be:
     (1) Addenda, change orders, and supplemental agreements
     (2) Contract
     (3) Permits from outside agencies required by law
     (4) Special provisions
     (5) Standard Specifications
     (6) Project Specifications
     (7) Drawings
     (8) Standard details
     (9) Reference specifications

     In case of any ambiguity or dispute over interpretation of the provisions of the contract, the decision of the City Engineer will be final.

4. WARRANTY
   - A. 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 of 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. The extent of the warranty period is not less than one year, or longer as noted for materials in their respective specification divisions.

B. If, after ten days, the Contractor fails to proceed to cure any breach of this warranty, the Owner may have the defects corrected and the Contractor and its surety shall be liable for all expenses incurred. In case of an emergency where, in the opinion of the Owner or the Architect, delay would cause serious loss or damage, corrective work may be undertaken without advance notice to the Contractor, but Contractor and its surety shall remain liable for all expenses incurred. The remedies stated in this subparagraph are not exclusive, but are cumulative of any other remedies the Owner may have.

C. Contractor shall assign to Owner, and shall deliver to the Owner, all suppliers information, manufacturers specification information, maintenance requirements, and warranties not later than the date of final acceptance of the Work by the Owner.

5. 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.

6. PERMITS, FEES

The Owner shall arrange and pay for any plan check fees, building permit fees, system development fees, utility connection fees required by code or other regulatory agencies. All subcontractor and trade permit fees are to be paid for by the contractor.

7. INDEMNIFICATION

A. To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Owners consultants, 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 attorney's 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 9.

B. In claims against any person or entity indemnified under this Section 9 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 9 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.

8. ARCHITECTS ADMINISTRATION OF THE CONTRACT

A. 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.

B. The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed upon 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.

C. The Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

D. 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.

E. 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work.

F. 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.

9. RECORD SET OF CHANGES

A. The Contractor shall, throughout the course of the Work, maintain a set of as-built construction plans which are updated at least monthly to identify all changes in the Work. These plans shall incorporate all changes, including substitutions, to the Work, including but not limited to changes in substitutions due to change orders, construction change directives, orders for minor changes in the Work and details clarified by requests for information, supplemental instructions, or based upon approved shop drawings.

B. These plans shall be maintained at the job site and shall be available during normal working hours for review by the Architect and Owner.

C. A copy of the final as-built plans shall be verified by the Architect for the work that the Architect is aware of as complete and accurate as reasonably possible and shall be provided to the Owner following completion of the Work.

D. The Architect shall not be held responsible for omissions of information provided by the Contractor or concealed work not observed by the Architect.

10. FINAL COMPLETION

A. FINAL COMPLETION

1. Final Completion is the stage in the progress of the Work when the Work or designated portion thereof is complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use and is complete in all respects, all systems operational, and a Final Occupancy Permit issued.

2. When the Contractor considers that the Work is finally complete, the Contractor shall prepare and submit to the Architect written notice that they have completed all Work in accordance with the Contract Documents.

3. Upon receipt of the Contractor's notice, the Architect will make an inspection to determine whether the Work or designated portion thereof is finally 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, the Contractor shall, before issuance of the Certificate of Final 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 Final Completion.

4. When the Work or designated portion thereof is finally complete, the Architect will prepare a Certificate of Final Completion that shall establish the date of Final Completion, shall transfer responsibilities to the Owner from the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. Warranties required by the Contract Documents shall commence on the date of Final Completion of the Work unless otherwise provided in the Certificate of Final Completion.

5. The Certificate of Final Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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.

11. INSURANCE

A. CONTRACTOR'S LIABILITY INSURANCE

1. The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
   a. Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
   b. Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
   c. Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
   d. Claims for damages insured by usual personal injury liability coverage;
   e. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
   f. Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
   g. Claims for bodily injury or property damage arising out of completed operations; and
   h. Claims involving contractual liability insurance applicable to the Contractor's obligations.

2. The Contractor's liability insurance shall include and cover the Owner and the Architect, their employees and agents, as additional insured for operations performed by the Contractor and its Subcontractors. The insurance shall be primary coverage and not concurrent with the Owner's or Architect's coverage.

3. The obligation of the Contractor under this Article 11 shall not extend to the liability of the Architect or its consultants for (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs, or specifications, or (2) the giving or failure to give directions or instructions by the Architect or its consultants, provided that the directions, or failure to provide direction, is the primary cause of the injury or damage.

4. The Contractor's insurance must be written by an insurance company acceptable to the Owner. Insurance carriers qualifying only under the surplus line laws of the State of Oregon are not acceptable unless specifically approved in writing by the Owner.

5. The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until date of final payment

and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

6. Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of 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 time required. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

7. The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the owners consultants, 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 Contactor'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 during the Contractor's completed operations.

B. OWNER'S LIABILITY INSURANCE

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

C. PROPERTY INSURANCE

The provisions of this section shall modify Section 107.05.03 of the *Standard Construction Specifications*.

1. Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contact Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Owner has an insurable interest in the property required by this Section 15 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

2. Property insurance shall be on an "all-risk" or equivalent policy and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

3. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

4. If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

12. CLAIMS AND DISPUTES

A. CLAIMS

1. DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, 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.

2. NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written 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 must 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.

3. CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

B. MEDIATION

1. Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided in other Sections shall be subject to mediation as a condition precedent to binding dispute resolution.

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 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, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

3. 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.

C. ARBITRATION

1. If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claims 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. A demand for arbitration shall be made in writing, delivered to the other party 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.

2. 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.

3. 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.

4. 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.

D. CONSOLIDATION OR JOINDER

1. Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided (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).

2. Either party, at its sole discretion, 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.

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 the Owner and Contractor under this Agreement.

LIST OF APPENDICES

A. AIA DOCUMENT A305 - 2020 - CONTRACTOR'S QUALIFICATION STATEMENT

B. PROJECT MANUAL – FIRE STATION 15

C. CONSTRUCTION DRAWINGS - FIRE STATION 15

AIA® Document A305™ – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

[ ] Exhibit A – General Information
[ ] Exhibit B – Financial and Performance Information
[ ] Exhibit C – Project-Specific Information
[ ] Exhibit D – Past Project Experience
[ ] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

NOTARY
State of:
County of:
Signed and sworn to before me this day of

_____
Notary Signature

My commission expires:

ADDITIONS AND DELETIONS:
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There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 13:48:34 PT on 01/26/2021 under Order No. 2146877413 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A305™ – 2020, Contractor's Qualification Statement, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

.2 If your organization is a partnership, identify its partners and its date of organization.

.3 If your organization is individually owned, identify its owner and date of organization.

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.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

§ A.1.3.2 How many full-time employees work for your organization?

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

Additions and Deletions Report for

AIA® Document A305™ – 2020 Exhibit A

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There are no differences.

AIA® Document A305™ – 2020 Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

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§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

.2 been terminated for any reason except for an owners' convenience?

.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

.4 filed any lawsuits or requested arbitration regarding a construction project?

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

.2 had any business or professional license subjected to disciplinary action?

.3 been penalized or fined by a state or federal environmental agency?

Additions and Deletions Report for

AIA® Document A305™ – 2020 Exhibit B

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There are no differences.

AIA® Document A305™ – 2020 Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

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§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

§ C.4.2 If requested, will your organization be able to provide property insurance for the Project 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?

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.3? If so, identify.

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

§ C.5.2 Surety company name:

§ C.5.3 Surety agent name and contact information:

§ C.5.4 Total bonding capacity:

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

Additions and Deletions Report for

AIA® Document A305™ – 2020 Exhibit C

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PAGE 3

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance ~~A.3.2.2.2?~~ A.3.2.2.3? If so, identify.

AIA® Document A305™ – 2020 Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

AIA® Document A305™ – 2020 Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Millersburg Fire Station

B. Owner's Name: City of Millersburg.

C. Architect's Name: Soderstrom Architects.

D. The Project consists of the construction of a new approximately 10,200 SF firestation and associated site work, and construction of a new public street.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in City Contract Documents.

1.03 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Final Acceptance. Some items include:
   1. Furnishings, unless otherwise noted on drawings
   2. Artwork.
   3. Coffee Maker.

B. Owner will supply the following for installation by Contractor:
   1. Combination Washer/Dryer unit.
   2. Television.
   3. A portion of the Turnout Lockers, as described in the drawings.
   4. _____.

1.04 FUTURE WORK

A. Project is designed for future opening at NW Apparatus Bay, and future expansion to West.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Final Acceptance.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.
   2. The greater project site, including some areas containing underground utilities, is being used as active farmland. Use and disturbance of these areas needs to be coordinated with the farmer's planting and harvesting schedule. Activity in these areas will like need to be postponed until late summer/early fall. The Owner will provide specific time frame restrictions regarding these areas.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Time Restrictions:
   1. Limit conduct of exterior work to the hours of 7 AM to 10 PM.

D. Utility Outages and Shutdown:
   1. Limit shutdown of utility services to agreed upon hours of time, arranged at least 24 hours in advance with Owner.

2. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. City of Albany Standard Specifications Division 1 - General Requirements: Additional requirements for progress payments, final payment, changes in the Work.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Owner and Architect for approval.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic and three hard-copies of each Application for Payment.

I. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 01 3000.
2. Construction progress schedule, revised and current as specified in Section 01 3000.
3. Current construction photographs specified in Section 01 3000.
4. Partial release of liens from major subcontractors and vendors.

J. When Owner or Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, upon Owner approval, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's negotiated Contract Amount.
2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

F. Substantiation of Costs: Provide full information required for evaluation.
1. Provide the following data:
   a. Quantities of products, labor, and equipment.
   b. Taxes, insurance, and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information:
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.
      b. As an incentive to encourage the Contractor to propose substitutions of products that yield potential cost saving opportunities for the project, the City of Millersburg will equally share with the Contractor any negotiated savings for substitutions that are accepted and approved.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

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.

2. Substitution Request Information:
    a. Discrete and consecutive Substitution Request number, and descriptive subject/title.
    b. Indication of whether the substitution is for cause or convenience.
    c. Issue date.
    d. Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
    e. Description of Substitution.
    f. Reason why the specified item cannot be provided.
    g. Differences between proposed substitution and specified item.
    h. Description of how proposed substitution affects other parts of work.
    i. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
        1) Physical characteristics.
        2) In-service performance.
        3) Expected durability.
        4) Visual effect.
        5) Warranties.
        6) Other salient features and requirements.
        7) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
    j. Impact of Substitution:
        1) Savings to Owner for accepting substitution.
        2) Change to Contract Time due to accepting substitution.

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. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

B. Submittal Form (before award of contract):
    1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). 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 CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience within 14 days of 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.
    b. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.

3.04 RESOLUTION

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

B. Upon Owner's approval, Architect will notify Contractor in writing of decision to accept or reject request.
1. Architect's decision following review of proposed substitution will be noted on the submitted form.

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.

3.07 ATTACHMENTS

A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

END OF SECTION

SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Progress photographs.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Requests for Interpretation (RFI) procedures.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 01 6000 - Product Requirements: General product requirements.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Final Acceptance.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. Contractor and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, Owner and Owner's consultants, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: Use one of the following:
1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
2. Newforma ConstructEx: www.newforma.com/products/constructex/#sle.
3. ProCore: www.procore.com.
4. PlanGrid by Autodesk: www.plangrid.com.
5. Other service as mutually agreed upon by Architect and Contractor

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service. If agreed by all parties, pre-recorded tutorials may be acceptable.
1. Representatives of Owner are scheduled and included in this training.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Submission of initial Submittal schedule.
6. Designation of personnel representing the parties to Contract, the Contractor and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Scheduling activities of a Geotechnical Engineer.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Special consultants.
   5. Contractor's superintendent.
   6. Major subcontractors.

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements and occupancy prior to completion.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Special consultants, as appropriate to agenda topics for each meeting.
   5. Contractor's superintendent.
   6. Major subcontractors and suppliers, as approptriate to agenda topics for each meeting.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress, including 2-3 week look ahead schedule.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs log and status of responses.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Maintenance of quality and work standards.
   11. Effect of proposed changes on progress schedule and coordination.
   12. Other business relating to work.

E. Record minutes and distribute copies within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

3.06 PROGRESS PHOTOGRAPHS

A. Submit new photographs at least once a month, within 3 days after being taken.

B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.

C. Photography Type: Digital; electronic files.

D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

E. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

F. Views:
   1. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
   2. Provide non-aerial photographs from four cardinal views at each specified time, until date of Final Acceptance.
   3. Consult with Architect for instructions on views required.
   4. Provide factual presentation.
   5. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.

3.07 COORDINATION DRAWINGS

A. Provide information required by Architect for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.08 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.

b. Do not forward requests which solely require internal coordination between subcontractors.
c. RFI's send directly to the Architect or the Architect's consultants that are note submitted through, reviewed by, and signed by the Contractor shall not be accepted and will be returned unanswered.

2. Prepare using software provided by the Electronic Document Submittal Service.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

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

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Final Acceptance.

B. Submit Final Correction Punch List for Final Acceptance.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Review submittals, make necessary corrections, and become familiar with the content of the submittal prior to turning material over to the Architect
   2. Use a single transmittal for related items.
   3. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   4. Transmit using approved form.
      a. Use form generated by Electronic Document Submittal Service software.
   5. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   6. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   7. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   8. Upload submittals in electronic form to Electronic Document Submittal Service website.
   9. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   11. Provide space for Contractor and Architect review stamps.
   12. When revised for resubmission, identify all changes made since previous submission.
   13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   15. Submittals not requested will not be recognized or processed.
   16. Keep one copy of all approved Shop Drawings, samples, and product data in the field office at all times.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.

2. Modify standard product data to delete information which is not applicable to this project. Supply additional data if required to show clearly what is intended.
3. Modify manufacturere's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data to show specific product application intended for the project.
4. Collect required information into a single submittal.
5. Submit concurrently with related shop drawing submittal.
6. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image. Include any identifying product marks as well as the finish surface of the product. These image files do not replace the need for physical samples.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
2) Non-responsive resubmittals may be rejected.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 3216

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit updated 2-3 week look ahead at each Progress Meeting

G. Submit in PDF format.

H. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

1.05 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 22 x 17 inches or width required.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Indicate delivery dates for owner-furnished products.

G. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.

H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Completion.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. City Contract Documents
B. Section 01 3000 - Administrative Requirements: Submittal procedures.
C. Section 01 4216 - Definitions.
D. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

1.04 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
    1. Design Services Types Required:
        a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
        b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
    1. Temporary sheeting, shoring, or supports.
    2. Temporary scaffolding.
    3. Temporary bracing.
    4. Temporary foundation underpinning.
    5. Temporary stairs or steps required for construction access only.

6. Temporary hoist(s) and rigging.
7. Investigation of soil conditions and design of temporary foundations to support construction equipment.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
   1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
   2. Concrete Mix and Structural Design: As described in Section 03 4500 - Precast Architectural Concrete.
   3. Anchors and attachment of pre-cast panels: As described in Section 03 4500 - Precast Architectural Concrete
   4. Structural Design of Metal-Web Wood Joists: As described in Section 06 1736 - Metal-Web Wood Joists.
   5. Sprinkler Layout and Design: Include calculations, detailed layout, component locations, control diagrams, wiring diagrams, and sequences of operation. Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 21 1300 - Fire-Suppression Sprinkler Systems.
   6. Fire Alarm: System design including detailed layout, component locations, control diagrams, wiring diagrams, and sequences of operation, as described in 28 4600 - Fire Detection and Alarm
   7. Design of seismic bracing for Mechanical, Electrical, and Plumbing system components, including piping, supports, conduit and other items, as required by OSSC 2019 for Risk IV type buildings.
   8. Landscape Irrigation: System and controls design, including type and layout of irrigation devices and piping.

1.07 SUBMITTALS

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

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:

a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.09 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Final Acceptance.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.

2. Make corrections as necessary until Architect's approval is issued.

I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required, along with Structural Drawings.

B. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Attend preconstruction meetings and progress meetings as applicable.
7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and Owner, it is not practical to remove and replace the work, Architect and Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4216

DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 SPECIFICATION WORDING

A. These Specifications are of abbreviated or "streamlined" type and shall frequently include incomplete sentences. Words such as "shall", "shall be", "Contractor shall", and similar mandatory phrases shall be supplied by inference in the same manner as if they were in a note on the Drawings. Contractor shall provide all items listed and perform all operations required, in accordance with the General Conditions, if and as modified in these Specifications.

1.03 DEFINITIONS

A. Approved (as used herein): approved by the Architect.

B. As directed: as directed by the Architect.

C. B.O. (By Owner) or F.O.I.C.: item or material in question will be furnished by Owner and installed by Contractor. Contractor to verify all requirements affecting his work.

D. For approval: for Architect's approval.

E. Furnish: To supply, deliver, unload, and inspect for damage.

F. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

G. N.I.C. (Not in Contract) or F.O.I.O.: item or material in question will be furnished and installed by Owner. Contractor is to verify all requirements affecting this work.

H. No Exception: no other product other than what is specifically named by the Owner or Architect listed in the Specifications.

I. OFCI (Owner Furnished, Contractor Installed): item or material in question will be furnished by Owner and installed by Contractor. Contractor to verify all requirements affecting his work.

J. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

K. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

L. Provide: To furnish and install.

M. Selected: selected by Architect.

N. Supply: Same as Furnish.

O. Where words "or approved" are used, Architect is sole judge of quality and suitability of proposed substitution.

1.04 STANDARD SPECIFICATIONS

A. When standard trade specifications are included in these specifications by reference, they shall be made a part of these Specifications to the same extent as if herein written out in full. Unless specifications note specifically otherwise, the most recent edition of such specifications shall supersede any such requirements of such standard specifications.

1.05 SPECIFICATION DIVISIONS

A. The Project Manual has been set up in Sections conforming roughly to customary trade practice for convenience only. The Architect is not bound to define the extent of work or responsibility of any sub-contractors.

1.06 LOCATION

A. The location of materials or articles given in the Project Manual under the heading "Location" is for a guide and may not include every location where such materials or articles are required. Contractor shall consult the Drawings and Schedules for additional locations where such materials or articles are required and provide them as specified for the listed items. In addition to the items specified, everything shown on the Drawings is included as part of the Contract unless it is specifically excluded.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5100 - Temporary Utilities.

B. Section 01 5500 - Vehicular Access and Parking.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. Provide and pay for all electrical power, lighting, heating and cooling, and ventilation required for construction purposes.

B. New permanent facilities may be used.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

1. Telephone Lines: Provide Architect and Owner with contact info for on-site Superintendent.
2. Internet Connection: May be provided by celluar or other internet service provider.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 SECURITY - SEE SECTION 01 3553

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.09 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Existing parking areas located at the house immediately north of the project site may be used for construction parking.

1.10 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

A. The Owner will provide access to a City-owned house located onsite for use as Field Office during the course of the project. Plumbing fixtures are provided, but house does not currently have water service. Contractor will be responsible for connecting new water service to the house

B. Furnishings: sturdy furniture, drawing rack, and drawing display table.

C. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Final Acceptance inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Provide power service required from utility source.

C. Power Service Characteristics: 208 volt, 200 ampere, three phase, four wire.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
   1. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 1000 sq ft of active work area.
   2. Provide 20 ampere, single phase branch circuits for lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
   1. The use of diesel fired space heaters inside the building is strictly forbidden.

C. Enclose building prior to activating temporary heat.

D. Provide temporary heat before any casework or floor materials are delivered to the job site

E. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

F. Owner's new heat plant may NOT be used until the following occurs:
   1. Compliance with Section 01 5719 - Temporary Environmental Controls
   2. Exercise measures to conserve energy.
   3. Enclose building prior to activating temporary heat.
   4. Provide separate metering and reimburse Owner for cost of energy used.

G. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Owner's new cooling plant may NOT be used until the following occurs:
   1. Compliance with Section 01 5719 - Temporary Environmental Controls
   2. Exercise measures to conserve energy.
   3. Enclose building prior to activating temporary cooling.
   4. Provide separate metering and reimburse Owner for cost of energy used.

E. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5500

VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.
B. Parking.
C. Permanent pavements and parking facilities.
D. Construction parking controls.
E. Flag persons.
F. Flares and lights.
G. Haul routes.
H. Traffic signs and signals.
I. Maintenance.
J. Removal, repair.
K. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

A. Section 31 2000 - Earth Moving: Specifications for earthwork and paving bases.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 5813 - Temporary Project Signage.
B. Automatic Traffic Control Signals: As approved by local jurisdictions.
C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is not permitted.
B. Tracked vehicles not allowed on paved areas.
C. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
D. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
E. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.
F. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

G. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

B. Use of designated areas of new parking facilities by construction personnel is permitted.

C. Do not allow heavy vehicles or construction equipment in parking areas.

D. Arrange for temporary parking areas to accommodate use of construction personnel.

E. When site space is not adequate, provide additional off-site parking.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Final Acceptance the base rock for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as work progresses, to maintain effective traffic control.

3.10 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 REMOVAL, REPAIR

A. Remove temporary roads when permanent paving is usable.

B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.

C. Repair existing facilities damaged by use, to original condition.

D. Remove equipment and devices when no longer required.

E. Repair damage caused by installation.

F. Remove post settings to a depth of 2 feet.

3.12 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 5713

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2017.

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.

E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of State of Oregon Erosion and Sedimentation Control Manual.
   1. Contractor is responsible for obtaining the 1200-C permit and City of Millersburg EPSC permit prior to start of construction.

B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Obtain and pay for permits and provide security required by authority having jurisdiction.

D. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

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

B. Erosion and Sedimentation Control Plan:
   1. Submit within 2 weeks after Notice to Proceed.
   2. Include:
      a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
      b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
      c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
      d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
      e. Other information required by law.
      f. Format required by law is acceptable, provided any additional information specified is also included.
   3. Obtain the approval of the Plan by authorities having jurisdiction.
   4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Wood waste, chips, or bark.
   3. Erosion control matting or netting.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.
   1. Cross Section: 14 by 18 inches, minimum.
   2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
   2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491/D4491M.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
   6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
   7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
   2. Softwood, 4 by 4 inches in cross section.
   3. Hardwood, 2 by 2 inches in cross section.

G. Gravel: See Section 32 1123 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet, minimum.
   2. Length: 50 feet, minimum.
   3. Provide at each construction entrance from public right-of-way.

4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
      b. Along the toe of cut slopes and fill slopes.
      c. Across the entrances to culverts that receive runoff from disturbed areas.
   2. Space sediment barriers with the following maximum slope length upslope from barrier:
      a. Slope of Less Than 2 Percent: 100 feet..
      b. Slope Between 2 and 5 Percent: 75 feet.
      c. Slope Between 5 and 10 Percent: 50 feet.
      d. Slope Between 10 and 20 Percent: 25 feet.
      e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches.
   2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
   3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
   7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   8. Fasten fabric to wood posts using one of the following:

a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gauge, 0.083 inch shank diameter.
b. Five staples per post with at least 17 gauge, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.

9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Wood Waste: Apply 6 to 9 tons per acre.
3. Erosion Control Matting: Comply with manufacturer's instructions.

E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Erosion Control Matting: Comply with manufacturer's instructions.

F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.

3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect or Owner.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01 5719

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality after completion of construction.

D. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC: Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

1.04 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).

C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology); 2016.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

E. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air; April 1990.

F. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; Jan-99.

G. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

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

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.

1. Submit not less than 60 days before enclosure of building.
2. Identify potential sources of odor and dust.
3. Identify construction activities likely to produce odor or dust.
4. Identify areas of project potentially affected, especially occupied areas.
5. Evaluate potential problems by severity and describe methods of control.
6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus.
5. Sampling methods.

F. Air Contaminant Test Reports: Show:
1. Location where each sample was taken, and time.
2. Test values for each air sample; average the values of each set of 3.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.

G. Ventilation Effectiveness Test Plan: Identify:
1. Testing agency qualifications.
2. Description of test spaces, including locations of air sampling.
3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
4. Test instruments and apparatus; identify tracer gas to be used.
5. Sampling methods.

H. Ventilation Effectiveness Test Reports: Show:
1. Include preliminary tests of instruments and apparatus and of test spaces.
2. Calculation of ventilation effectiveness, E.
3. Location where each sample was taken, and time.
4. Test values for each air sample.
5. HVAC operating conditions.
6. Other information specified in ASHRAE Std 129.
7. Other conditions or discrepancies that might have influenced results.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. HVAC equipment and supply air ductwork may be used for ventilation during construction:
   1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
   2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
   3. Do not use return air ductwork for ventilation.
   4. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air; provide alternate return air pathways.
   5. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

E. Do not store construction materials or waste in mechanical or electrical rooms.

F. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

H. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

I. After application of all interior sealants, paints and other general finishes, and before the installation of any carpets, fabric coverings, furniture or furnishings, provide for a minimum of 5 day Purge with building temperatures maintained at or above 70 degrees Fahrenheit, prior to the Owner's occupancy of any part of the building. This is separate from the Building Flush-Out described below.
   1. Purge: A period of time during which the completed work is exposed to maximum rates of fresh air ventilation for the purpose of evacuating VOCs from the facility.

3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:
   1. All construction is complete.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
   4. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
   1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
   2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.

3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
   a. Begin ventilation at least three hours prior to daily occupancy.
   b. Continue ventilation during all occupied periods.
   c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before occupancy.

C. Do not start air contaminant testing until:
1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. New HVAC filtration media have been installed.

D. Indoor Air Samples: Collect from spaces representative of occupied areas:
1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
3. Collect samples from height from 36 inches to 72 inches above floor.
4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
6. When retesting the same building areas, take samples from at least the same locations as in first test.

E. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

F. Analyze air samples and submit report.

G. Air Contaminant Concentration Limits:
1. Formaldehyde: Not more than 27 parts per billion.
2. PM10 Particulates: Not more than 50 micrograms per cubic meter.
3. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
5. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
6. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.

H. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
2. Particulates: EPA 600/4-90/010 Method IP-10.
3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.

5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

3.04 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.

B. Do not begin ventilation effectiveness testing until:
1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
2. Building flush-out or air contaminant testing has been completed satisfactorily.
3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE Std 129.

D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner.

3.05 CORRECTION OF NON-CONFORMING CONDITIONS

A. Develop and submit to Owner, for approval, a plan for addressing non-conforming conditions.

B. Correct causes of non-conforming conditions. If required, remove and replace source(s) of contaminants at no additional cost to the Owner.

C. Provide additional air quality monitoring and testing, at no additional cost to the Owner, until such time as conformance is verified to the Owner's satisfaction.

D. The Owner reserves the right to waive part of the specified criteria to address unusual considerations without negating the balance of these requirements.

END OF SECTION

SECTION 01 5813

TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.03 SUBMITTALS

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

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of white color.

E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign, 48 sq ft area, bottom 6 feet above ground.

B. Content:

1. Project number, title, logo and name of Owner as indicated on Contract Documents.
2. Names and titles of Owner and Owner's Representative
3. Names and titles of authorities.
4. Names and titles of Architect and Consultants.
5. Name of Prime Contractor and major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.03 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at designated location.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Identification of Owner-supplied products.

B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:

1. Made using or containing CFC's or HCFC's.
2. Made of wood from newly cut old growth timber.
3. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions, as defined in Section 01 6116.
2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Have longer documented life span under normal use.
5. Result in less construction waste. See Section 01 7419
6. Are made of recycled materials.
7. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. Products that are designated "No Exception" means no other product other than what is specifically named by the Owner or Architect listed in the specifications

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Do not store products directly on the ground.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

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

END OF SECTION

SECTION 01 6116

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Thermal and acoustical insulation.
   3. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

I. SCS (CPD) - SCS Certified Products; Current Edition.

J. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

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

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 5713 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

F. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

G. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

H. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

I. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

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

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.

e. Alternatives to cutting and patching.
f. Effect on work of Owner or separate Contractor.
g. Written permission of affected separate Contractor.
h. Date and time work will be executed.

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

1.04 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Owner and Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Perform dewatering activities, as required, for the duration of the project.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
1. Minimize amount of bare soil exposed at one time.
2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
1. Outdoors: Limit conduct of exterior work to the hours of 7 AM to 10 PM.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within three days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that established by Owner provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust and other contaminates so that they do not fall on wet or newly coated surfaces.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.11 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous and recommended by the manufacturer of the suface material to be cleaned.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Repair or replace materials or equipment that has been damaged by improper cleaning materials or methods.

J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Final Completion.

C. Notify Architect when work is considered ready for Architect's Final Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Final Completion inspection.

E. Owner will occupy all of the building as specified in Section 01 1000 once Final Acceptance has occurred.

F. Conduct Final Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Final Acceptance final inspection.

I. Complete items of work determined by Architect listed in Punch List prior to Final Acceptance by Owner.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Final Acceptance or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
   6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   7. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   8. Glass.
   9. Gypsum drywall and plaster.
   10. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   11. Paint.
   12. Plastic sheeting.
   13. Rigid foam insulation.
   14. Windows, doors, and door hardware.
   15. Plumbing fixtures.
   16. Mechanical and electrical equipment.
   17. Fluorescent lamps (light bulbs).
   18. Acoustical ceiling tile and panels.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

H. The following sources may be useful in developing the Waste Management Plan:
   1. State Recycling Department, at http://www.oregon.gov/deq/mm/Pages/default.aspx.

I. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

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

B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.

1. Submit to Architect for Owner's review and approval.
2. If Owner wishes to implement any cost alternatives, the Contract Sum will be adjusted as specified elsewhere.
3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
4. Describe as many alternatives to landfilling as possible:
    a. List each material proposed to be salvaged, reused, or recycled.
    b. List the proposed local market for each material.
    c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.

C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.

D. Waste Management Plan: Include the following information:
1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
    a. List each material proposed to be salvaged, reused, or recycled.
    b. List the local market for each material.
    c. State the estimated net cost, versus landfill disposal.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
    c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. As a minimum, provide:
      a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
      b. Separate dumpsters for each category of recyclable.
      c. Recycling bins at worker lunch area.
   2. Provide containers as required.
   3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   5. Locate enclosures out of the way of construction traffic.
   6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
   8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Final Acceptance, prior to final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.
   7. Field test results.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information. Where the literature covers more than one model, check off neatly in ink correct model number and data for the actual equipment used on this project.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.
   5. At a time convenient to the Owner and the Contractor, arrange a meeting designed to instruct the Owner's personnel in the proper care and use of the system.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports.

O. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. With Owner's agreement, a thumb drive or other digital medium may be used to deliver a PDF copy of the Operation and Maintenance manual in place of hard copies. Confirm with Owner and Architect prior to finalizing.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for

items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Final Acceptance is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

I. With Owner's agreement, a thumb drive or other digital medium may be used to deliver a PDF copy of the Warranties and Bonds in place of hard copies. Confirm with Owner and Architect prior to finalizing.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

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

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.

3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Final Acceptance.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Final Acceptance.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.

3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 03 3511 - Concrete Floor Finishes

D. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

D. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

G. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

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

B. Product Data: Provide data on void form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.02 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.

2.03 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gauge, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Preformed Aluminum Forms: ASTM B221 (ASTM B221M), 6061-T6 alloy, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

D. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, cone type, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless mineral oil-based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: In compliance with applicable local, State, and federal regulations.

C. Filler Strips for Chamfered Corners: Rigid plastic type; 3/4 by 3/4 inch size; maximum possible lengths.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are permitted only as noted on plans.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Coordinate this section with other sections of work that require attachment of components to formwork.

G. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.06 SLEEVES, PIPES OR CONDUITS

A. Aluminum shall not be embedded in structural concrete unless effectively coated.

B. Secure bolts, inserts and other embedded items so that they will not be displaced during the placing and compacting operations. Set embedded bolts and sleeves for slab-mounted equipment with the aid of templates from manufacturer's layouts for shop drawings.

C. The locations of a portion of subsurface or hidden utilities (such as sewer, water, gas, electric power, and telephone) whose locations are known have been shown on the Drawings. Protect, plug or reroute as shown or specified.

D. Lines of undetermined locations may traverse the site or supply existing construction. Protect active lines. Remove inactive lines from within building lines, and plug in a manner approved by the serving utility and Owner.

E. Make repairs to damaged known active lines at no cost to the Owner. Known active lines include those indicated on working drawings of existing construction which have been made available to the Contractor by the Owner.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

C. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do not patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

C. ACI SP-66 - ACI Detailing Manual; 2004.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

F. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2016.

G. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

H. CRSI (DA4) - Manual of Standard Practice; 2009.

1.04 SUBMITTALS

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

B. Shop Drawings: Comply with requirements of ACI SP-66. and CRSI (DA4). Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel (all non-welded structural reinforcement): ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.

B. Reinforcing Steel (all welded reinforcement): ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.

C. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. Galvanize all components.
   3. Use only concrete dobies under reinforcing in slabs on grade. Do not use metal chairs.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Unless otherwise noted, maintain concrete cover around reinforcing as follows:
   1. Walls (exposed to weather or backfill): 2 inch.
   2. Footings and Concrete Formed Against Earth: 3 inch.
   3. Slabs on Fill: 1-1/2 inch clear to top.

D. Conform to applicable code for concrete cover over reinforcement and ACI 318.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Concrete shear walls, foundation walls, and footings.

C. Joint devices associated with concrete work.

D. Miscellaneous concrete elements, including equipment pads, light pole bases, and flagpole bases.

E. Concrete curing.

F. Underslab Vapor Retarder

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

D. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

E. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting; 2010.

F. ACI 306R - Guide to Cold Weather Concreting; 2016.

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.

L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

N. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

O. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

P. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

S. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.

T. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

U. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.

V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.

W. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

X. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

Y. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

Z. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Test Reports: Submit report for each test or series of tests specified.

F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

1. Acquire aggregates for entire project from same source.

C. Lightweight Aggregate: ASTM C330/C330M.

D. Fly Ash: ASTM C618, Class C or F.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
3. Manufacturers:
a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
b. Stego Industries, LLC; 15-mil: www.stegoindustries.com/#sle.
c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
a. Maximum: Plus 4 percent.
b. Minimum: Plus 1 percent.
3. Manufacturers:
a. USG
b. Sonneborne
c. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with mimimum 1 inch diameter round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
1. Height: To suit slab thickness.

2.07 CURING MATERIALS

A. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.

B. Moisture-Retaining Sheet: ASTM C171.

1. Curing paper, regular.
2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated.
   2. Water-Cement Ratio: Maximum 45 percent by weight.
   3. Maximum Aggregate Size: 5/8 inch.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Architect not less than 24 hours prior to commencement of placement operations.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing

laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.04 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
   3. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be polished.
   3. Apparatus Bay Slab: Provide a steel trowel finish with a slight raised texture showing trowel marks (sweat trowel finish). Review with Architect for approval of finish.
   4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects. Apply chemical hardener
   5. Chemical Hardener: See Section 03 3511.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

F. Concrete Polishing: See Section 03 3511.

3.07 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
      b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.10 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 3511

CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid densifiers and hardeners.

B. Polished concrete.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

1.05 MOCK-UP

A. Mock-Up Size: 10 feet square.

B. Locate at area to receive floor covering, at location coordinated with Architect.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on the Date of Final Acceptance.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Unless otherwise indicated, all concrete floors are to be finished using polished concrete finish.

B. Liquid Densifier and Hardener:
   1. Use at following locations: Apparatus Bay and support rooms within the Apparatus Bay envelope.

C. Polished Finish:
   1. Use at following locations: As indicated on Drawings.

2.02 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
   1. Meet requirements of ASTM C109/C109M
   2. No VOC's.
   3. Products:
      a. Curecrete Distribution, Inc; Ashford Formula: www.curecrete.com/#sle.
      b. Nox-Crete Inc; Duro-Nox: www.nox-crete.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Acceptable Systems:
      a. Curecrete Distribution, Inc; RetroPlate: www.curecrete.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 CONCRETE POLISHING

A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
   1. Final Polished Sheen: Semigloss finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
   2. Semi-Gloss Finish: Reflecting overhead and side images from 35 to 45 feet away.

B. Protect finished surface as required and as recommended by manufacturer of polishing system.

END OF SECTION

SECTION 03 4500

PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural precast concrete water table.

B. Supports, anchors, and attachments.

C. Grouting under panels.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete: Admixtures.

C. Section 07 9200 - Joint Sealants: Sealing perimeter and intermediate joints.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

H. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

I. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

J. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2017.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

N. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

Q. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; 2007.

R. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; 2010, Seventh Edition.

S. PCI MNL-122 - Architectural Precast Concrete; 2007, Third Edition.

T. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988, Second Edition.

U. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.05 SUBMITTALS

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

B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.

C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection and attachment details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
   1. Include details of mix designs.
   2. Include structural design calculations.
   3. Include attachment requirements and calculations

D. Samples: Submit two sections, 12 inch by 6 inch in size, illustrating surface finish, color and texture for each type used.

E. Fabricator's Qualification Statement: Provide documentation showing precast concrete fabricator is accredited under IAS AC157.

F. Maintenance Data: Indicate surface cleaning instructions.

1.06 QUALITY ASSURANCE

A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.

B. Fabricator Qualifications:
   1. Firm having at least 2 years of documented experience in production of precast concrete of the type required.
   2. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.
   3. Plant certified under Architectural Precast Association Plant Certification Program for production of architectural precast concrete.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.07 MOCK-UP

A. Provide as part of exterior wall mock-up, with lifting device, and attachment points, and finish in accordance with approved sample.

B. Include mock-up panel with typical window, sealants, and flashing and trim.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handling: Lift and support precast units only from support points.

B. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.

C. Protect units to prevent staining, chipping, or spalling of concrete.

D. Mark units with date of production in location that will be concealed after installation.

PART 2 PRODUCTS

2.01 PRECAST UNITS, GENERAL

A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.

1. Concrete Face Mix: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent; comply with ACI 301.
   a. Cement Content: 50 percent white cement; Lehigh or approved.
   b. Sand Content: 20 percent white sand.
2. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
3. Calculate structural properties of units in accordance with ACI 318.
4. Other Cementitious Materials: Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with strength and appearance requirements.
5. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
6. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.

B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance. Color to match limestone sample provided by Architect.
   1. Exposed-to-View Finish Surface: Light acid etch.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Structural Aggregates: ASTM C33/C33M.
   1. Sand: Regionally available material.

C. Lightweight Structural Aggregate: ASTM C330/C330M.

D. Surface Finish Aggregate: Conforming to sample in office of Architect. Provide regionally available materials, with color and aggregate size as approved by Architect.

E. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).
   2. Manufacturers:
      a. Butterfield Color: www.butterfieldcolor.com.
      b. Davis Colors: www.daviscolors.com.
      c. Lambert Corporation: www.lambertusa.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

G. Fiber Reinforcement: Synthetic fiber shown to be resistant to long-term deterioration when exposed to moisture and alkalis; 1/2 inch length.

H. Admixtures: Air entrainment as specified in Section 03 3000.

I. Grout:
   1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.04 SUPPORT DEVICES

A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
   1. Clean surfaces of rust, scale, grease, and foreign matter.
   2. Galvanize after fabrication in accordance with requirements of ASTM A123/A123M.

B. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563 (ASTM A563M) nuts and matching washers.

2.05 FABRICATION

A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.

B. Maintain plant records and quality control program during production of precast units. Make records available upon request.

C. Maintain consistent quality during manufacture.

D. Fabricate connecting devices, plates, angles, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.

E. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.

F. Place recessed flashing reglets continuous and straight.

G. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

H. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.06 FABRICATION TOLERANCES

A. Comply with PCI MNL-117 and PCI MNL-135, except as specifically amended below.
   1. Maximum Variation From Nominal Face Dimensions: Plus or minus 3/32 in.
   2. Maximum Variation From Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
   3. Maximum Variation from Thickness: Plus or minus 1/8 in.
   4. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
   5. Maximum Bowing of Members: Plus or minus length/360.

2.07 SOURCE QUALITY CONTROL

A. Provide testing and analysis of concrete mix.

B. Take one concrete test cylinders for every one cu yd of concrete placed; make and cure in accordance with ASTM C31/C31M.

C. Take one slump tests for every one test cylinders in accordance with ASTM C143/C143M.

D. Take water absorption test in accordance with PCI MNL-117.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

A. Erect units without damage to shape or finish. Replace or repair damaged panels.

B. Erect units level and plumb within allowable tolerances.

C. Align and maintain uniform horizontal and vertical joints as erection progresses.

D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.

E. Fasten units in place with mechanical connections.

F. Touch-up field welds and scratched or damaged primed painted surfaces.

G. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.

H. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.
   1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.

2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
3. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
4. Exposed Joint Dimension: Plus or minus 3/16 inch.
5. Maximum Jog in Alignment of Matching Faces or Edges: Plus or minus 3/16 inch.
6. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

3.05 PROTECTION

A. Provide non-combustible shields during welding operations.

B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 04 2000

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.

I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

N. ASTM C476 - Standard Specification for Grout for Masonry; 2016.

O. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.

P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.

Q. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

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

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four samples of typical units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
   2. Special Shapes: Provide non-standard blocks configured for corners and top of wall.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture.
   4. Non-Loadbearing Units: ASTM C129.
      a. Hollow block, as indicated.

2.02 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type N.
   2. Color: Standard gray.

H. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

2.03 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.

B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

2.04 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type N.
   3. Exterior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Raked.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.07 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

3.08 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.09 BUILT-IN WORK

A. Install built-in items plumb, level, and true to line.

B. Bed anchors of gate frames/attachment in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

C. Do not build into masonry construction organic materials that are subject to deterioration.

3.10 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

3.11 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.13 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.14 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members and struts.

C. Base plates, shear stud connectors.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

I. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.

J. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

K. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

M. 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; 2017.

N. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

O. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.

P. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

Q. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.

R. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.

S. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2016.

T. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

U. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

V. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

W. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with April 2015 Errata.

1.04 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Structural steel members designated as architecturally-exposed structural steel (AESS) to also comply with Section 05 1213.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

E. Pipe: ASTM A53/A53M, Grade B, Finish galvanized.

F. Structural Bolts and Nuts: Carbon steel, ASTM A307 or ASTM A325 as noted, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.

G. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

H. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be field welded or in contact with concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed or where shop coat has been damaged, except surfaces to be in contact with concrete.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ____ percent of bolts at each connection.

C. Welded Connections: Visually inspect all field-welded connections and test at least ____ percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

B. Downspout boots.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 03 4500 - Precast Architectural Concrete: Placement of metal fabrication in precast architectural concrete.

C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 5213 - Pipe and Tube Railings.

E. Section 05 7500 - Decorative Formed Metal: Metal column wraps

F. Section 07 6200 - Sheet Metal Flashing and Trim

G. Section 09 9113 - Exterior Painting: Paint finish.

H. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

J. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Guard Rails: As detailed; prime paint finish.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

2.04 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied primer finish.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.

2.05 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5213

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Free-standing railings at steps.

C. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

C. Section 09 9113 - Exterior Painting: Paint finish.

D. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

F. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017.

G. AWS C3.4M/C3.4 - Specification for Torch Brazing; 2016.

H. AWS C3.5M/C 3.5 - Specification for Induction Brazing; 2007.

I. AWS C3.9M/C3.9 - Specification for Resistance Brazing; 2009.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Include the design engineer's seal and signature on each sheet of shop drawings.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to stud walls, provide backing plates, for bolting anchors.
   3. Posts: Provide adjustable flanged brackets.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
      b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
   3. Brass/Bronze Brazed Joints:
      a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
      b. Perform induction brazing in accordance with AWS C3.5M/C 3.5.
      c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

B. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 7500

DECORATIVE FORMED METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Closures, trim, and filler panels.
   2. Factory fabricated column covers.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016a.

E. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2014.

F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2017.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

J. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

K. ASTM D523 - Standard Test Method for Specular Gloss; 2014.

L. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.

M. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.

N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

O. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2015.

P. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

Q. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2009 (Reapproved 2015).

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

S. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017.

T. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

1.03 SUBMITTALS

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

B. Product Data - Sheet Metal Material: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.

3. Installation methods.
4. Specimen warranty.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Show actual field measurements on shop drawings.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the fabrications must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Maintenance Data: Care of finishes and warranty requirements.

F. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating products specified in this section.
   1. With not less than three years of documented experience.
   2. Approved by MCM sheet manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. MCM Sheet Manufacturer’s Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 5 years:
   1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
   2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 FORMED METAL FABRICATIONS - GENERAL

A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.

G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.
   1. Ease exposed edges to small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
      b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.

H. Performance Requirements:
   1. Thermal Movements:
      a. Allow for thermal movements in exterior metal fabrications due to temperature changes. Prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
      b. Temperature Change Range: 120 degrees F, ambient; 180 degrees F, on material surfaces.
   2. Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

2.02 FORMED METAL FABRICATIONS - SHEET METAL

A. Closures, Trim and Fill Panels:
   1. Form closures from type and thickness of metal indicated.
   2. Conceal fasteners when possible.
   3. Drill and tap holes for securing to other surfaces.
   4. Provide gaskets where indicated or needed for continuous seal at adjacent surfaces.
   5. Miter or cope at corners and reinforce with bent metal plate. Form tight joints.

2.03 FACTORY FABRICATED COLUMN COVERS

A. Factory Fabricated Column Covers: Factory fabricated and factory finished, sheet metal column covers, mechanically fastened to structural support.
   1. Material: Aluminum sheet, ASTM B209 or ASTM B209M, alloy 3003 or 5005.
   2. Sheet Thickness: 0.125 inch, minimum.
   3. Column Section Length: 12 feet, maximum, between horizontal joints.
   4. Joint Type: Butt.
   5. Fasteners: Self-drilling; ASTM A449 heat treated steel, with manufacturer's standard corrosion resistant coating.
   6. Aluminum Finish: Manufacturer's standard factory applied PVDF coating.

7. Color: To be selected by Architect from manufacturer's full range.

2.04 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Aluminum Sheet: ASTM B209 or ASTM B209M, 5005-H32 minimum; alloy and temper recommended by aluminum producer and finisher for use and finish indicated.

C. Anchors, Clips and Accessories: Use one of the following:
   1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
   2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
   3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 35.
   4. Exterior Locations or in Contact with Stainless Steel:
      a. Bolts: Stainless steel; ASTM F593, Group 1 (A1).
      b. Nuts: Stainless steel; ASTM F594.
   5. Structural Anchors: Provide anchors where work is indicated to comply with design loads.
      a. Type: Provide chemical or torque-controlled expansion anchors.
      b. Capacity: When tested according to ASTM E488/E488M; four times the load imposed when installed in concrete.
   6. Nonstructural Anchors: Provide powder-actuated fasteners where work is not indicated to comply with design loads. Provide size and number required for load, installation, and as recommended by manufacturer, unless indicated otherwise.

D. Fasteners, General: Same basic metal and alloy as formed metal sheet unless indicated otherwise. Do not use metals incompatible with the materials joined.

E. Gaskets: As required to seal joints in decorative formed metal and remain airtight; as recommended in writing by decorative formed metal manufacturer.
   1. ASTM D1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain seal for application indicated.

F. Joint Sealer, Exterior: ASTM C920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in decorative formed metal and remain weathertight; and as recommended in writing by decorative formed metal manufacturer.

2.05 FINISHES

A. Finishes, General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

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

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION - SHEET METAL AND PLATE FABRICATIONS

A. Locate and place decorative formed sheet metal items level and plumb; align with adjacent construction. Cut, drill and fit as required to install.

B. Do not cut or abrade sheet metal finishes that cannot be completely restored in the field. Return such items to manufacturer or fabricator for required alterations and refinishing or provide new items.

C. Use concealed anchorages where possible. Provide washers where needed on bolts or screws to protect metal surfaces and make weathertight connection.

D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers indicated.

E. Install gaskets, joint fillers, insulation, sealants, and flashings as work progresses.
   1. Make exterior decorative formed sheet metal items weatherproof.
   2. Make interior decorative formed metal items soundproof or lightproof as required.

F. Corrosion Protection: Apply permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with incompatible substrate materials. Prevent corrosion damage to material and finish.

3.04 CLEANING

A. Restore finishes damaged during installation and construction period. Return items that cannot be refinished in the field to manufacturer or fabricator. Refinish entire unit or provide new units.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect installed products from damage during construction.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Nonstructural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Subflooring.
F. Roofing nailers.
G. Preservative treated wood materials.
H. Miscellaneous framing and sheathing.
I. Communications and electrical room mounting boards.
J. Concealed wood blocking, nailers, and supports.
K. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
C. Section 06 1736 - Metal-Web Wood Joists.
D. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
E. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.
F. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.
H. PS 1 - Structural Plywood; 2009.
I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
J. PS 20 - American Softwood Lumber Standard; 2020.
K. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.
L. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.04 SUBMITTALS

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

B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 6by6 inch in size illustrating wood grain, color, and general appearance.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER

A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).

B. Grading Agency: Western Wood Products Association; WWPA G-5.

C. Sizes: Nominal sizes as indicated on drawings, S4S.

D. Moisture Content: S-dry or MC19.

E. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 2.

F. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Machine stress-rated (MSR) as follows:
      a. Fb-single; minimum extreme fiber stress in bending: 1350 psi.
      b. E; minimum modulus of elasticity: 1,300,000 psi.
   2. Species: Douglas Fir-Larch.

G. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 EXPOSED DIMENSION LUMBER

A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).

B. Grading Agency: Western Wood Products Association; WWPA G-5.

C. Sizes: Nominal sizes as indicated on drawings.

D. Surfacing: S4S.

E. Moisture Content: S-dry or MC19.

F. Stud Framing (2 by 2 through 2 by 6):

1. Species: Douglas Fir.
2. Grade: Clear.

G. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
1. Species: Douglas Fir.
2. Grade: Select Heart.

2.04 EXPOSED TIMBERS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (20 percent maximum).

C. Surfacing: S4S.

D. Species: Douglas Fir.

E. Grade: Clear Heart Structural.

2.05 STRUCTURAL COMPOSITE LUMBER

A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
1. Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi, minimum.
2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi, minimum.
3. Headers Not Longer Than 48 inches: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber.

2.06 CONSTRUCTION PANELS

A. Subflooring: PS 2 type, rated Sheathing.
1. Bond Classification: Exterior.
2. Span Rating: 48.
3. Performance Category: 3/4 PERF CAT.

B. Subflooring: Particleboard, ANSI A208.1, Grade M-2 EXTERIOR GLUE waferboard; 3/4 inch thick, square edge.

C. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
1. Bond Classification: Exterior.
2. Span Rating: 32/16.
3. Performance Category: 5/8 PERF CAT.

D. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 40/20.
5. Edges: Square.
6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.

E. Wall Sheathing, Exterior: Plywood, PS 1, Grade C-D, Exposure I.

F. Wall Sheathing, Interior: See Section 09 2116.

G. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

H. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.07 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for exterior, high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

D. Sill Flashing: As specified in Section 07 6200.

E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

F. Water-Resistive Barrier: As specified in Section 07 2500.

2.08 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.
      e. Treat lumber less than 18 inches above grade.
   2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
      a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
      b. Treat plywood less than 18 inches above grade.
   3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
      a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
      b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 4 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

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

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Other areas as indicated on drawings.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Subflooring: Glue and nail to framing; staples are not permitted.

C. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges provide solid edge blocking where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

D. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

E. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size: 48 by 96 inches, installed horizontally at ceiling height.

3.07 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING

A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1736

METAL-WEB WOOD JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Joists for roof framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. SPIB (GR) - Grading Rules; 2014.

1.04 SYSTEM DESCRIPTION

A. Design roof live and dead load: ____ lbs/sq ft with deflection limited to 1/240 of span.

1.05 SUBMITTALS

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

B. Product Data: Provide joist configurations, bearing and anchor details, bridging and bracing.

C. Shop Drawings: Indicate framing system, sizes and spacing of joists, loads and joist cambers, required openings for web penetrations, framed openings. Submit design calculations.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design joists under direct supervision of a Professional Structural Engineer experienced in design of this product type and licensed in the State in which the Project is located.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect joists from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Joists:
   1. MiTek Industries, Inc; _____: www.mii.com/#sle.
   2. RedBuilt LLC; Open Web Trusses: www.redbuilt.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for loading, seismic zoning, and other governing load criteria.

2.03 MATERIALS

A. Lumber:
   1. Grade: SPIB (GR), Grade _____.
   2. Moisture Content: Between 7 and 9 percent.
   3. Lumber fabricated from old growth timber is not permitted.

B. Wood Chord Members: Single top and bottom chord, Stress Group ____, 19 percent maximum moisture content. Finger scarfing permitted.

C. Web Members: Cold rolled steel tubing, electrogalvanized, minimum yield strength of _____ psi, accurately die stamped, electrically welded.

D. Connecting Pins: Electrogalvanized structural carbon steel.

E. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

2.04 FABRICATION

A. Fabricate joists to achieve structural requirements indicated.

2.05 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 1000.

B. Fasteners: Electrogalvanized steel, type to suit application.

C. Bearing Plates: Electrogalvanized, unfinished steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

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

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Coordinate installation of sheathing/decking.

H. After erection, touch-up galvanized surfaces with primer consistent with shop coat.

3.04 TOLERANCES

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

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

B. Section 08 1416 - Flush Wood Doors.

C. Section 09 9113 - Exterior Painting: Painting of finish carpentry items.

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

E. Section 09 9300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

1.04 SUBMITTALS

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

B. Product Data:
   1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

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

D. Samples: Submit two samples of finish plywood, 12 by 12 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two of finish tongue and groove boards, width x 12 inches in size, illustrating wood grain and specified finish.

F. Samples: Submit two samples of wood trim 9 inch long.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

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

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear fir; prepare for transparent finish.
   2. Tongue and Groove Ceiling: Clear fir, prepare for transparent finish
   3. Loose Shelving: Clear fir, prepare for transparent finish.

2.02 LUMBER MATERIALS

A. Softwood Lumber: Western Red Cedar species, plain sawn, maximum moisture content of 12 percent; with vertical grain, of quality suitable for transparent finish.

B. Hardwood Lumber: Douglas Fir or Hemlock species, plain sawn, maximum moisture content of 11 percent; with vertical grain, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, plain sawn, running matched, medium density fiberboard core, glue type as recommended for application.

2.04 ACCESSORIES

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

B. Aluminum Edge Trim: Extruded convex shape; smooth surface finish; self locking serrated tongue; of width to match component thickness; natural mill finish.

C. Primer: Alkyd primer sealer.

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

2.05 HARDWARE

A. Standard Shelf Brackets:
   1. Material: Steel.
   2. Style: Concealed
   3. Finish: Manufacturer's standard, factory-applied, textured powder coat.
   4. Color: Black.
   5. Products:
      a. Basis of Design: A&M Hardware, Inc ; Concealed Brackets, 1.0" series: http://www.aandmhardware.com/#sle.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

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

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 5, Varnish, Conversion.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

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

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

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

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

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

C. Factory finishing.

D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

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

B. Section 06 2000 - Finish Carpentry: Support brackets for shelving

C. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

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

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

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. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

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.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

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. Wood Veneer Faced Cabinet:
   1. Exposed Surfaces: HPVA HP-1 Grade A, Hemlock, plain sliced, random-matched.
   2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Hemlock, plain sliced, random-matched.
   3. Concealed Surfaces: Manufacturer's option.

C. Plastic Laminate Faced Cabinets: Custom grade.

D. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Melamine, color as selected by Architect from manufacturer's standard line.
   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; flush 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. Adjustable Shelf Loading: 50 lbs. per sq. ft.

2.02 WOOD-BASED COMPONENTS

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

B. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

C. At wet areas (sinks, dishwashers, etc) use plywood for all substrates. MDF and particleboard not allowed

2.03 LAMINATE MATERIALS

A. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as indicated, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as indicated, finish as indicated.
   3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, color as selected, finish as selected.

2.04 COUNTERTOPS

A. Countertops are specified in 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. Concealed Joint Fasteners: Threaded steel.

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

F. Trash Waste Chute: 8" dia x 3" deep, stainless steel.
   1. Basis of Design: Mockett; TM2C: www.mockett.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.06 HARDWARE

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

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

C. Fixed Standard Shelf, Countertop, and Workstation Brackets:
   1. Material: Steel.

2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
3. Color: Black.

D. Fixed Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
1. Material: Steel.
2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
3. Color: Black.

E. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

F. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.

G. Catches: Touch type.

H. Drawer Slides:
1. Type: Full extension.
2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.

I. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

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

D. 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.
1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

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

2.08 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

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.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

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

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 D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

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

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

E. FM 4880 - Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems; 2010.

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. Samples: Submit two samples 6 by 6 inch in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc: www.marlite.com/#sle.
   3. Nudo Products, Inc: www.nudo.com/#sle.
   4. Panolam Industries International, Inc: www.panolam.com/#sle.
   5. Inpro: www.inpro.com
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.060 inch.
   3. Surface Design: Embossed.
   4. Color: As selected by Architect.
   5. Attachment Method: Adhesive only, sealant joints, no trim.

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.

2. Class 1 fire rated when tested in accordance with FM 4880.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

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. Board insulation and integral vapor retarder at exterior wall behind panel wall finish and roof deck or sheathing.

B. Batt insulation and vapor retarder in wall construction.

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

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 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 C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

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

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

G. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

1.04 SUBMITTALS

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

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

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Over Framed Walls, Continuous: Mineral fiber board.

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

C. Insulation Over Roof Deck: Polyisocyanurate board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type I: Faced with aluminum foil on both major surfaces of core foam.
         1) Class 1 - Non-reinforced core foam.

2) Compressive Strength: 16 psi, minimum.
3) Thermal Resistance, R-value: At 1-1/2 inch thick; 9.0 at 75 degrees F.

2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Board Size: 48 inch by 96 inch.
5. Total Thermal Resistance: R-value of 21, including coverboard. Provide minimum 2 layers.
6. Board Edges: Square.
7. Products:
   a. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/#sle.
   b. Dow Chemical Company: www.dow.com/#sle.
   c. Johns Manville: www.jm.com/#sle.
   d. Firestone: www.firestonebpco.com.
   e. Substitutions: See Section 01 6000 - Product Requirements.

2.03 FIBERBOARD INSULATION MATERIALS

A. Mineral Fiberboard Insulation: Rigid or semi-rigid mineral fiber, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Where indicated, provide fiberglass reinforced polypropylene facing on one side; with flame spread index of 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Board Size: 24 by 48 inches.
   4. Board Thickness: 1 inch.
   5. Thermal Resistance: R-value of 4.3 degrees F hr sq ft/Btu per inch at 75 degrees F, minimum, when tested according to ASTM C518.
   6. Maximum Density: 4.4 pounds per cubic foot, nominal.
   7. Products:
      a. Johns Manville; CladStone ___ Water & Fire Block Insulation: www.jm.com/#sle.
      b. ROCKWOOL (ROXUL, Inc); CAVITYROCK: www.rockwool.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 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. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value of 19.
   6. Facing: Unfaced.
   7. Products:
      a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
      b. Knauf Insulation, Inc.; EcoBatt Insulation: www.knaufinsulation.us..
      c. Substitutions: See Section 01 6000 - Product Requirements.

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.
   3. Thermal Resistance: R-value of 19.
   4. Products:
      a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.

b. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Sheet Vapor Retarder: See Section 07 2500.

B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Continuous Insulation (CI) Support Systems: Composite framing support (CFS) system consisting of insulated fiberglass reinforced plastic (FRP) girts that support CI and provide cladding attachment support integrated with metal wall panels or cement fiberboard exterior wall cladding.
1. Substrate: Attach CFS system components to exterior sheathing over wood stud framing.
2. Depth of Girts: As required for thickness of insulation.
3. Length: 6 inches for clips, and 96 inches for girts.
4. Spacing of Girts: 16 inches on center, vertically.
5. Products:
a. Advanced Architectural Products, LLC; SMARTci Plus 3-in-1 System: www.smartcisystems.com/#sle.
b. Armatherm; Z Girt Structural Thermal Break: www.armatherm.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

F. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.
1. Install in running bond pattern.
2. Butt edges and ends tightly to adjacent boards and protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION USING COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

A. Install CFS system in accordance with manufacturer's installation instructions.

B. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.

C. Install CFS system to fill-in exterior wall spaces without gaps or voids, and do not compress insulation boards.

D. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids with approved expandable foam sealant.

3.04 BOARD INSTALLATION OVER ROOF DECK

A. Board Installation Over Roof Deck, General:
1. See applicable roofing specification section for specific board installation requirements.
2. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.

3. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
4. Do not apply more insulation than can be covered with roofing on the same day.
5. Install minimum of two layers, with seams offset a minimum of 6 inches from preceding layer.

3.05 BATT INSTALLATION

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

B. Install in exterior wall and ceiling 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. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

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

G. Tape seal tears or cuts in vapor retarder.

H. 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.

I. Coordinate work of this section with requirements for vapor retarder, see Section 07 2500.

J. Coordinate work of this section with construction of air barrier seal, see Section 07 2500.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Per Oregon Energy Efficiency Specialty Code, provide either R-value indentification mark applied by manufacturer to every piece of insulation greater than 12 inches in width, or installers to provide a signed, dated, and posted certification listing the type, manufacturer, and R-value of insulation installed. Do not remove until notified by Building Official.

3.07 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500

WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

C. Section 07 4113 - Metal Roof Panels: Roofing underlayment membrane as part of roof assembly

D. Section 07 6519 - Ice and Water Shield: Self-adhered flashing as part of roof assembly

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2015a.

D. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

G. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

H. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

I. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.

J. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

K. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.05 SUBMITTALS

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

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

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier (Also functions as Exterior Vapor Retarder and Water Resistive Barrier):
1. On outside surface of sheathing of exterior walls use air barrier sheet, self-adhered type or coating, fluid applied type.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Self-Adhered: Primer is not required on substrate materials.
1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).
4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 150 days of weather exposure.
5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
6. Complies with NFPA 285 wall assembly requirements.
7. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
8. Seam and Perimeter Tape: As recommended by sheet manufacturer.
9. Manufacturers:
   a. GCP Applied Technologies; Perm-A-Barrier VPS 30: www.gcpat.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

B. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
1. Air Barrier Coating:
   a. Material: Silyl-terminated polyether (STPE)
   b. Dry Film Thickness (DFT): 12 mil, 12 inch, minimum.
   c. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   d. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B (Water Method) at 73.4 degrees F.
   e. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to twelve months of weather exposure after application.
   f. Elongation: 250 percent, minimum, when tested in accordance with ASTM D412.
   g. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   h. Complies with NFPA 285 wall assembly requirements.
   i. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
   j. VOC Content: 30 g per L or less.
   k. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
   l. Sealants, Tapes and Accessories: As recommended by coating manufacturer.

m. Manufacturers:
1) PROSOCO, Inc; R-GUARD Cat 5 Rainscreen: www.prosoco.com/r-guard/#sle.
2) Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
1. Composition: Butyl rubber sheet laminated to elasticized polyethylene sheet.
2. Thickness: 40 mil, 40 inch, nominal.
3. Manufacturers:
a. GCP Applied Technologies; Perm-A-Barrier Wall Flashing and Perm-A-Barrier Detail Membrane: www.gcpat.com.
b. Substitutions: See Section 01 6000 - Product Requirements.

C. Sill Plate Sealer: Polyethylene foam gasket; bridges gap between foundation structure and sill plate.
1. Width: 3-1/2 inches.
2. Thickness: 1/4 inches (6.35 mm).
3. Manufacturers:
a. Owens Corning; ProPink ComfortSeal Sill Gasket: www.owenscorning.com.
b. Substitutions: See Section 01 6000 - Product Requirements.

D. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.
1. Manufacturers:
a. PROSOCO, Inc; R-GUARD FastFlash: www.prosoco.com/r-guard.
b. Substitutions: See Section 01 6000 - Product Requirements.

E. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

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

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Self-Adhered Sheets:
1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
2. Lap sheets shingle-fashion to shed water and seal laps air tight.
3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.

4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
5. At wide joints, provide extra flexible membrane allowing joint movement.

G. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Use flashing to seal to adjacent construction and to bridge joints.

H. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 4113

METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Roof sheathing.

B. Section 07 2100 - Thermal Insulation: Rigid roof insulation.

C. Section 07 4213 - Metal Wall Panels: Preformed wall panels.

D. Section 07 6519 - Ice and Water Shield

1.03 REFERENCE STANDARDS

A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2015a.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

D. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).

E. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2017.

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. Summary of test results, indicating compliance with specified requirements.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's qualification statement.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Final Acceptance.

C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Final Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Firestone UC-6 metal roofing panel

B. Architectural Metal Roof Panels:
1. ATAS International, Inc: www.atas.com/#sle.
2. Firestone Building Products LLC: www.firestonebpco.com.
3. Metl-Span, a Division of NCI Group, Inc: www.metlspan.com.
4. AEP Span: www.aepspan.com.
5. Taylor Metal: www.taylormetal.com
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Panels: Factory-formed panels with factory-applied finish.
1. Steel Panels:
   a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 coating.
   b. Steel Thickness: Minimum 24 gauge (0.024 inch).
2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system for field seaming with special tool, 180 degree bend on seam.
3. Texture: Smooth.
4. Length: Maximum possible length to minimize lapped joints. Where lapped joints are unavoidable, space laps so that each sheet spans over three or more supports.
5. Width: Maximum panel coverage of 16 inches.

2.04 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.06 FINISHES

A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer’s standards.

2.07 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
   3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Thermal Insulation: See section 07 2100 - Thermal Insulation

E. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 65 mil total thickness; with strippable release film and polyethylene top surface.
   1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   3. Water Vapor Permeance: 0.015 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
   4. UL Classification: UL Class A
   5. Manufacturers:
      a. Firestone "CLAD-GARD SA-FR": www.firestonebpco.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

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

3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Coordinate installation of waterproof membrane over roof sheathing with 06 1000.

D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

E. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.

2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, caps, rib closures, ridge closures, and similar roof accessory items.

C. Install underlayment over insulation before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.

D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
3. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

E. Insulation: Install insulation between roof covering and supporting members to present a neat appearance. Fold, staple, and tape seams unless otherwise approved by Architect.
1. See Section 07 2100 - Thermal Insulation for additional installation requirements.

3.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Final Acceptance.

END OF SECTION

SECTION 07 4213

METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels and subgirt framing assembly, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation.

B. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.

C. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 SUBMITTALS

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

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, factory mitered corner units, and methods of anchorage.

D. Samples: Submit two samples of wall panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

1.05 MOCK-UP

A. Construct mock-up, 10 feet long by 10 feet wide; include panel system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation in mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Final Acceptance for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners:
   1. McElroy Metal; Mega-Rib: www.mcelroymetal.com/#sle.
   2. Petersen Aluminum Corporation; 7.2 Panel: www.pac-clad.com/#sle.
   3. Taylor Metals: www.taylormetal.com.

4. AEP Span; Box Rib: www.aepspan.com
5. Dimension Metals Inc; WP72: www.dmimetals.com
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Provide exterior wall panels and factory-mitered corner panels.
2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
3. Design Pressure: In accordance with applicable codes.
4. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
8. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.

B. Exterior Wall Panels:
1. Profile: Horizontal; style as indicated.
2. Side Seams: lapped, sealed with continuous bead of sealant.
3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
4. Panel Width: 36 inches.
5. Color: As selected by Architect from manufacturer's full line.

C. Subgirt Framing Assembly:
1. 16 gauge, 0.0598 inch thick formed non-precoated steel sheet.
2. Profile as indicated; to attach panel system to building.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

G. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

2.05 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant.

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

3.03 INSTALLATION

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

B. Fasten panels to structural supports; aligned, level, and plumb.

C. Locate joints over supports.

D. Lap panel ends minimum 2 inches.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 4646

FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

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

B. Section 07 2100 - Thermal Insulation: Rigid insulation under siding

C. Section 07 2500 - Weather Barriers: Weather barrier under siding.

D. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

E. Section 09 9113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Installer's Qualification Statement.

E. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Final Acceptance.

C. Provide multi-year manufacturer warranty as indicated under Siding article sub-heading "Warranty".

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length (Height): 96 inches, nominal. Cut to size as indicated on drawings
   3. Width: 48 inches. Cut to size as indicated on drawings
   4. Thickness: 7/16 inch, nominal.
   5. Finish: Factory applied primer, field painted
   6. Warranty: 30 year limited; transferable.
   7. Manufacturers:
      a. James Hardie Building Products, Inc; Aspyre Collection - Reveal Panel: www.aspyredesign.com
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length: 96 inches, nominal.
   3. Width: 48 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Factory applied primer.
   6. Manufacturer: Same as siding.

2.02 ACCESSORIES

A. Furring Strips: Galvanized metal channels.

B. Fiber Cement Panel Siding Metal Trim: Extruded aluminum alloy 6063-T5 temper.
   1. Dimension and Layout: As indicated on drawings.
   2. Finish: Powder coating.
      a. Color: As selected by Architect.
   3. Manufacturers:
      a. James Hardie; Aspyre Collection Reveal Panel Edgeless System: www.aspyredesign.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate complete wall assembly.

D. Exterior Soffit Vents: One piece, perforated, ASTM B221 (ASTM B221M), 6063 alloy, T5 temper, aluminum, with flat panel edge and manufactured especially for soffit application, and provide continuous vent.

E. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

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

3.02 PREPARATION

A. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Over Foam Sheathing: Read and comply with sheathing manufacturer's recommendations.
   1. For sheathing of less than 1 inch thickness, nail through sheathing into studs using correspondingly longer nails.
   2. For sheathing greater than 1 inch thickness, install furring strips over studs and fasten siding through furring and into studs.

D. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

E. Joints: Install manufacturer trim or flashing as indicated.

F. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

G. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area specified.

H. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

I. Finish Painting: Refer to Section 09 9113.

3.04 PROTECTION

A. Protect installed products until Date of Final Acceptance.

B. Touch-up, repair or replace damaged products before Date of Final Acceptance.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Field fabricated roof curbs.

B. Section 07 4113 - Metal Roof Panels: Manufacture's standard roof flashings

C. Section 07 4213 - Metal Wall Panels: Manufacture's pre-fabricated trims, flashings, and corners.

D. Section 07 7200 - Roof Accessories: Manufactured metal roof curbs.

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); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 6 by 6 inch in size illustrating metal finish color.

D. Samples: Submit one sample of the fabricated cornice, 12 inches minimum in length. Alternately, this can be provided as part of the project mock-up.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal, unless otherwise noted.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 20 gage, 0.032 inch thick base metal unless otherwise noted, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, (0.0156 inch) thick; smooth No. 4 - Brushed finish.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; use 1 inch high standing seams at horizontal surfaces; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing edge. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM), Rectangular profile.

B. Downspouts: Round profile.

C. Gutters and Downspouts: Size indicated.

D. Metal: Fabricate of pre-finished galvanized steel, color as selected from manufacturer's full line.

E. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Straps.
   3. Downspout Supports: Straps.

F. Downspout Boots: Cast iron.

G. Seal metal joints.

2.04 FASCIA

A. Profile: as indicated on drawings

B. Gage: minimum 18 ga

C. Metal: Fabricate of pre-finished galvanized steel, color as selected from manufacturer's full line.

D. Fabrication:
   1. Solder and sand all joints, field paint assembly

2.05 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

F. Reglets: Surface mounted type, galvanized steel.

G. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

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

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Comply with drawing details.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.

F. Secure gutters and downspouts in place with concealed fasteners.

G. Connect downspouts to downspout boots, and grout connection watertight.

3.04 SCHEDULE

A. Fascia: 18 GA

B. Gutters and Downspouts: 20 ga

C. Coping, Cap, Parapet, Sill and Ledge Flashings: 22 ga

D. Counterflashings at Roofing Terminations (over roofing base flashings): 22 ga

END OF SECTION

SECTION 07 6519

ICE AND WATER SHIELD

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.

B. Related Sections: Refer to the following specification sections for coordination:
   1. Section 07 4113 - Metal Roof Panels

C. Referenced Standards: Comply with the requirements of the following standards published by ASTM International to the extent referenced in this section.
   1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   2. ASTM D461 - Standard Test Methods for Felt.
   3. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
   4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   5. ASTM D3767 - Standard Practice for Rubber-Measurement of Dimensions.
   6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   7. ASTM G90 - EMMAqua test.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

B. Manufacturer: Minimum 10 years experience producing roofing underlayment.

C. Installer: Minimum 2 years experience with installation of similar underlayment.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

B. Cover materials and store in dry condition between temperatures of 40 and 90 degrees F (5 and 32 degrees C). Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: Grace Construction Products: www.na.graceconstruction.com.

B. Substitutions: See Section 01 6000 - Product Requirements

2.02 MATERIALS

A. Self-Adhering Sheet Membrane Roof Underlayment: Provide Grace Ice and Water Shield by Grace Construction Products with the following characteristics:
   1. Material: Cold applied, self adhering membrane composed of a high strength polyethylene film coated on one side with a layer of rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the polyethylene.
   2. Color: Gray-black.
   3. Membrane Thickness: 40 mil (1.02 mm) ASTM D3767 procedure A (Section 9.1).
   4. Tensile Strength, Membrane: 250 psi (1720 kN/m2) ASTM D412 (Die C modified).
   5. Elongation, Membrane: 250% ASTM D412 (Die C modified).
   6. Low Temperature Flexibility: Unaffected @ -20°F (-29°C) ASTM D1970.
   7. Adhesion to Plywood: 3.0 lbs/in. width (525 N/m) ASTM D903.

8. Permeance (Max): 0.05 Perms (2.9 ng/m2s Pa) ASTM E96.
9. Material Weight Installed (Max): 0.3 lb/ft2 (1.3 kg/m2) ASTM D461.
10. 10. Service Temperature: 180 degrees F (82.2 degrees C) per ASTM D1204
11. Primer: Water-based Perm-A-Barrier WB Primer by Grace Construction Products.
12. Code and Standards Compliance: Grace Ice and Water Shield meets the following:
    a. Underwriters Laboratories Inc. Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790).
    b. Underwriters Laboratories Inc. Classified Sheathing Material Fire Resistance Classification with Roof Designs: P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P736, P742, P803, P814, P818, P824.
    c. International Conference of Building Officials (ICBO-ES) Report No. 3997.
    d. Southern Building Code Congress International (SBCCI PST & ESI) Report No. 94133C.
    e. Building Officials and Code Administrators (BOCA-ES) Evaluation Report No. 94-33.
    f. Miami-Dade County Code Report NOA 02-113.02.
    g. Canadian Construction Materials Centre (CCMC) 12693-R
    h. U.S. Department of Housing and Urban Development (HUD) Materials Release 1056f.
    i. City of Los Angeles RR 25330
    j. Florida State Approval Report No. FL298-R1

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

3.02 INSTALLATION

A. Installation: Install roofing underlayment on sloped surfaces at locations indicated on the Drawings, but not less than at hips, ridges, eaves, valleys, sidewalls and chimneys, and surfaces over interior space within 36 inches (914 mm) from the inside face of the exterior wall. Strictly comply with manufacturer’s installation instructions including but not limited to the following:
    1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
    2. Do not install underlayment on wet or frozen substrates.
    3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
    4. Remove dust, dirt, loose materials and protrusions from deck surface.
    5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
    6. Prime concrete and masonry surfaces using specified primer at a rate of 500-600 square feet per gallon (12-15 sqm/L). Priming is not required for other suitable clean and dry surfaces.
    7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
    8. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
    9. Patch penetrations and damage using manufacturer’s recommended methods.

3.03 CLEANING AND PROTECTION

A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.

B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the Architect.

C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION

SECTION 07 7200

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

D. Non-penetrating pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 5300 - Elastomeric Membrane Roofing

B. Section 07 4113 - Metal Roof Panels.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

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.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings, HVAC units, and equipment supports.
   2. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   3. Sheet Metal Material:
   4. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.

5. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
   a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
   b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
   c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
   d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
6. Provide layouts and configurations indicated on drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 8 inches, minimum.
   4. Height Above Roof Deck: 14 inches, minimum.

C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Height Above Finished Roof Surface: 8 inches, minimum.

D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Height Above Finished Roof Surface: 8 inches, minimum.

2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Height: Provide minimum clearance of 8 inches under supported items to top of roofing.
   3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
   1. Bases: High density polypropylene.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

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.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Final Acceptance.

END OF SECTION

SECTION 07 8400

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies.

1.02 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

1.03 SUBMITTALS

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

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's qualification statement.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.

1.05 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. If accepted, mock-up will represent minimum standard for this work.

C. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
   3. Everkem Diversified Products, Inc: www.everkemproducts.com/#sle.
   4. Grabber Construction Products, Inc: www.grabberman.com/#sle.
   5. Hilti, Inc: www.us.hilti.com/#sle.
   6. HoldRite, a Brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
   7. Specified Technologies Inc: www.stifirestop.com/#sle.
   8. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 1300 - Sheet Waterproofing: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.

B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

C. Section 07 8400 - Firestopping: Firestopping sealants.

D. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 3000 - TILING: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

I. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of experience.

1.06 MOCK-UP

A. Install one sealant installation representative of each type of joint sealant and each joint sealant application. Install a minimum of 1 linear ft (1/3 linear m) of sealant.

B. If accepted, mock-up will represent minimum standard for the Work.

C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Exterior Sealants: Correct defective work within a ten year period after Date of Final Acceptance.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   3. Everkem Diversified Products, Inc: www.everkemproducts.com/#sle.
   4. Fortifiber Building Systems Group: www.fortifiber.com/#sle.
   5. Franklin International, Inc: www.titebond.com/#sle.
   6. Hilti, Inc: www.us.hilti.com/#sle.
   7. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
   8. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
   9. Pecora Corporation: www.pecora.com/#sle.
   10. QUIKRETE Companies: www.quikrete.com/#sle.
   11. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   12. Sika Corporation: www.usa-sika.com/#sle.
   13. Specified Technologies Inc: www.stifirestop.com/#sle.
   14. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   15. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
   16. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
   3. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.

4. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
5. Pecora Corporation: www.pecora.com/#sle.
6. QUIKRETE Companies: www.quikrete.com/#sle.
7. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
8. Sika Corporation: www.usa-sika.com/#sle.
9. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
10. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
11. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
         2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag silyl-terminated polyether/polyurethane sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
   3. Exposed Joints in Metal Panel Roofing Systems and Sheet Metal Fabrications at Roofs: Hybrid urethane sealant.
   4. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
   3. Floor Joints in Wet Areas: Self-leveling polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
   4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant or butyl rubber, non-curing.

6. At Penetrations in Fire-Rated, Sound-Rated Assemblies: Acrylic latex sealant, firestopping type.
7. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
8. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 NONSAG JOINT SEALANTS

A. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
2. Manufacturers:
a. Dow Chemical Company; DOWSIL 784 Silicone Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html.
b. General Electric Company; SCS1700 Sanitary Silicone Sealant: www.ge.com.
c. Substitutions: See Section 01 6000 - Product Requirements.

B. Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Color: Match adjacent finished surfaces.
3. Service Temperature Range: 0 to 180 degrees F.
4. Manufacturers:
a. Franklin International Inc; Titebond WeatherMaster Metal Roof Sealant: www.titebond.com/#sle.
b. Master Builders Solutions by BASF; MasterSeal NP100: www.master-builders-solutions.basf.us/en-us/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: Match adjacent finished surfaces.
3. Service Temperature Range: Minus 40 to 180 degrees F.
4. Manufacturers:
a. Master Builders Solutions by BASF; MasterSeal NP1: www.master-builders-solutions.basf.us/en-us/#sle.
b. Tremco Commercial Sealants & Waterproofing; Vulkem 116: www.tremcosealants.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

D. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
1. Movement Capability: Plus and minus 35 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with 1.
3. Color: Match adjacent finished surfaces.
4. Service Temperature Range: Minus 40 to 170 degrees F.
5. Manufacturers:
a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

E. Acrylic Emulsion Latex: Water-based acoustical; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).

3. Manufacturers:
    a. Master Builders Solutions by BASF; MasterSeal NP 520: www.master-builders-solutions.basf.us/en-us/#sle.
    b. Henkel Corporation; OSI SC175 Draft & Acoustical Sound Sealant: www.ositough.com.
    c. USG Corporation; USG Sheetrock Brand Acoustical Sealant: www.usg.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

F. Acrylic Latex Sealant: ASTM C834; for use as acoustical sealant and in firestopping systems for expansion joints and through penetrations.
1. Color: White.
2. Fire Rated System: Complies with UL 263 and ASTM E119 with UL fire resistance classifications.
3. Manufacturers:
    a. Pecora Corporation; AC-20 FTR (Fire and Temperature Rated): www.pecora.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

G. Non-Curing Butyl Sealant: Solvent-based acoustical, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.
1. Manufacturers:
    a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.
    b. Tremco Commercial Sealants & Waterproofing; Tremco Acoustical Sealant (interior applications only): www.tremcosealants.com.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 SELF-LEVELING SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 170 degrees F.
5. Manufacturers:
    a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; 1, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 170 degrees F.
5. Manufacturers:
    a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multi-component, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A, after seven days when tested in accordance with 1.
3. Color: Concrete gray.
4. Joint Width, Minimum: 1/8 inch.
5. Joint Width, Maximum: 3/4 inch.

6. Joint Depth: Provide product suitable for joints from 1/2 inch (13 mm) to 3 inches (76 mm) in depth excluding space for sand filler.
7. Manufacturers:
   a. Nox-Crete Inc; DynaFlex 502: www.nox-crete.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 08 0671

DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule of door hardware sets for swinging and other door types as indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

A. BHMA (CPD) - Certified Products Directory; 2017.

B. BHMA A156.3 - American National Standard for Exit Devices; 2014.

C. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.

D. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.

E. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.

F. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.

1.04 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers listed in Door Hardware Schedule or Section 08 7100 are considered acceptable, unless noted otherwise.

B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.

C. Products are listed and certified compliant with specified standards by BHMA (CPD).

D. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 7100.

1. CR - Corbin Russwin.
2. DMA - Dorma.
3. HGR - Hager.
4. HIA - Hiawatha.
5. IVE - Ives.
6. LCN - LCN.
7. McK - McKinney.
8. NGP - National Guard Products.
9. NOR - Norton.
10. PEM - Pemko.
11. ROC - Rockwood.
12. SA - Sargent.
13. SCH - Schlage.
14. STH - Stanley Commercial Hardware.
15. TR - Trimco.
16. VD - Von Duprin.

2.02 DESCRIPTION

A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.

1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.
3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 LOCK FUNCTION CODES

A. Function Codes for Cylindrical Locks: Complying with BHMA A156.5.
   1. Code F75; Passage: Latch retracted by knobs/levers at all times.
   2. Code F81; Office Lock: Turn button locking. Turning button on inside locks outside knob/lever until unlocked by key or by rotating the inside knob/lever. Inside knob/lever always free. Deadlocking latch bolt.
   3. Code F86; Storeroom Lock: Outside knob/lever always locked/rigid. Latchbolt retracted by key in outside knob/lever or by rotating inside knob/lever. Inside knob/lever always free. Deadlocking latchbolt.
   4. Code F91; Store Door Lock: Deadlocking latch bolt by levers. Key in either lever locks/unlocks both levers.

B. Function Codes for Mortise Locks: Complying with BHMA A156.13.
   1. Code F22; Privacy Lock: Latch bolt operated by knob from either side except when outside knob is locked by inside T-turn. Operating inside knob, closing door, or operating outside emergency release unlocks outside knob. Emergency tool finished with lock. Provide Occupancy Indicator

C. Function Codes for Exit Devices: Complying with BHMA A156.3.
   1. Code 09; Exit Device: Entrance by knob/lever with key (pullside) only. Unit is locked when the key is removed.

2.04 FINISHES

A. Finishes: Complying with BHMA A156.18.
   1. Code 626: Satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D).

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

3.02 HARDWARE SET # 01: "EXTERIOR DOOR"

A. For use on Door Number(s): 121A, 125F, 125G.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1168	US26D	HGR
1 Each	09	EXIT DEVICE	98-XP	626	VD
1 Each	F86	STOREROOM LOCK	ND80PD-ATH	626	SCH
1 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		LATCH PROTECTOR	320C	US32D	ROC
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		WEATHERSTRIP	S88BL	---	PEM
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
1 Each		SILENCER	SR64	---	IVE
1 Each		ELECTRIC STRIKE	Coordinate with Owner		
1 Each		KEYCARD READER	Coordinate with Owner		

3.03 HARDWARE SET # 02: "EXTERIOR STOREFRONT DOOR"

A. For use on Door Number(s): 101A, 107A, 121B.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
1 Each	09	EXIT DEVICE	98-XP	626	VD
1 Each	F86	STOREROOM LOCK	Core only – lever by door supplier		
1 Each		CLOSER	4040-MC	689	LCN
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
1 Each		WALL STOP	1270CV	626	TR
1 Each		ELECTRIC STRIKE	Coordinate with Owner		
1 Each		KEYCARD READER	Coordinate with Owner		

Balance of items by storefront door supplier

3.04 HARDWARE SET # 03: "EXTERIOR DOUBLE DOOR"

A. For use on Door Number(s): 132, 133.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
6 Each		HINGE	BB1168	US26D	HGR
1 Each	F86	STOREROOM LOCK	ND80PD-ATH	626	SCH
2 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		COORDINATOR			
2 Each		AUTOMATIC FLUSH BOLT			
1 Each		LATCH PROTECTOR	320C	US32D	ROC
2 Each		WALL STOP	1270CV	626	TR
2 Each		KICK PLATE	K0050-SS	630	TR
1 Each		WEATHERSTRIP	S88BL	---	PEM
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
2 Each		DOOR HOLDER	FS452	AL	IVE

3.05 HARDWARE SET # 04: "MEETING ROOM COURTYARD"

A. For use on Door Number(s): 121C.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
1 Each	F91	STORE DOOR LOCK	Core only – lever by door supplier		
1 Each		CLOSER	4040-MC	689	LCN
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
1 Each		WALL STOP	1270CV	626	TR
1 Each		DOOR HOLDER	FS452	AL	IVE

Balance of items by storefront door supplier. Door is locked in both directions unless specifically unlocked by key

3.06 HARDWARE SET # 05: "INTERIOR STOREFRONT DOOR"

A. For use on Door Number(s): 101B.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
1 Each	09	EXIT DEVICE	98-XP	626	VD
1 Each	F86	STOREROOM LOCK	Core only – lever by door supplier		
1 Each		CLOSER	4040-MC	689	LCN
1 Each		WALL STOP	1270CV	626	TR
1 Each		ELECTRIC STRIKE	Coordinate with Owner		
1 Each		KEYCARD READER	Coordinate with Owner		

Balance of items by storefront door supplier

3.07 HARDWARE SET # 06: "PASSAGE – AT APPARATUS BAY"

A. For use on Door Number(s): 103, 124, 128, 129, 130, 131

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1168	US26D	HGR
1 Each		PUSH PLATE	8200 4” x 16”	626	IVE
1 Each		PULL	8303-8 4" x 16", G Mount	626	IVE
1 Each		ROLLER LATCH	RL30	626	IVE
1 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		WEATHERSTRIP	S88BL	---	PEM
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
1 Each		SILENCER	SR64	---	IVE

3.08 HARDWARE SET # 07: "PASSAGE – AT RESIDENTIAL AREAS"

A. For use on Door Number(s): 102, 105, 107B, 109, 111, 122

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1191	US26D	HGR
1 Each	F75	PASSAGE LATCH	ND10S-ATH	626	SCH
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		SILENCER	SR64	---	IVE

3.07 HARDWARE SET # 08: "DORM ROOMS

A. For use on Door Number(s): 115, 116, 117, 118, 119, 120

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1191	US26D	HGR
1 Each	F75	PASSAGE LATCH	ND10S-ATH	626	SCH
1 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		ACOUSTIC GASKETING	303AS	AL	PEM
1 Each		AUTOMATIC DOOR BOTTOM	STC411	AL	PEM
1 Each		SILENCER	SR64	---	IVE

3.08 HARDWARE SET # 09: "RESTROOM DOOR"

A. For use on Door Number(s): 104, 112, 113, 114, 123.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1191	US26D	HGR
1 Each	F22	PRIVACY LOCK	L9040-N, with indicator	626	SCH
1 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		SILENCER	SR64	---	IVE

3.09 HARDWARE SET # 10: "IT ROOM"

A. For use on Door Number(s): 126.

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	BB1191	US26D	HGR
1 Each	F86	STOREROOM LOCK	ND80PD-ATH	626	SCH
1 Each		SURFACE CLOSER	4040-MC	689	LCN
1 Each		WALL STOP	1270CV	626	TR
1 Each		KICK PLATE	K0050-SS	630	TR
1 Each		WEATHERSTRIP	S88BL	---	PEM
1 Each		THRESHOLD	278x292_AFGPK	---	PEM
1 Each		SILENCER	SR64	---	IVE

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.
B. Hollow metal frames for wood doors.
C. Fire-rated hollow metal doors and frames.
D. Thermally insulated hollow metal doors with frames.
E. Sound-rated hollow metal doors and frames.
F. Hollow metal borrowed lites glazing frames.
G. Accessories, including glazing and louvers.

1.02 RELATED REQUIREMENTS

A. Section 08 1416 - Flush Wood Doors
B. Section 08 7100 - Door Hardware.
C. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).
C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
H. 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; 2017.
I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
J. ASTM C476 - Standard Specification for Grout for Masonry; 2016.
K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
M. ASTM E413 - Classification for Rating Sound Insulation; 2016.
N. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
P. ITS (DIR) - Directory of Listed Products; current edition.
Q. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames; 2012.

R. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

S. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

T. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

U. NAAMM HMMA 850 - Fire-Protection and Smoke Control Rated Hollow Metal Door and Frame Products; 2014.

V. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2013.

W. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.

X. NAAMM HMMA 865 - Guide Specifications for Sound Control Hollow Metal Doors and Frames; 2013.

Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

AA. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

AB. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

AC. 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.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
3. Steelcraft, an Allegion brand: www.allegion.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Sound-Rated Hollow Metal Doors and Frames:
1. Overly Door Company: www.overly.com/#sle.
2. IAC Acoustics; Noise-Lock Acoustic Doors: www.iacacoustics.com.
3. Noise Barriers, LLC; Quiet Swing Doors: www.noisebarriers.com
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. 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.

2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush. At STC rated doors, provide wood veneer to match wood door faces..
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.

B. 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 door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
1. Based on NAAMM HMMA Custom Guidelines:
    a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
    b. Performance Level 3 - Heavy Duty, in accordance with NAAMM HMMA 805.
    c. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.
    a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene minimum.
4. Door Thickness: 1-3/4 inches, nominal.
5. Weatherstripping: Refer to Section 08 7100.
6. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire Rated:
1. Based on NAAMM HMMA Custom Guidelines:
    a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
    b. Performance Level 2 - Moderate Duty, in accordance with NAAMM HMMA 805.
    c. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches, nominal.
4. Door Finish: Factory primed and field finished.

C. Fire-Rated Doors:
1. Based on NAAMM HMMA Custom Guidelines: Comply with NAAMM HMMA 850 requirements for fire-rated doors.
    a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.

b. Performance Level 2 - Moderate Duty, in accordance with NAAMM HMMA 805.
c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   a. Attach fire rating label to each fire rated unit.
4. Door Thickness: 1-3/4 inches, nominal.

D. Sound-Rated Interior Doors:
1. Based on NAAMM HMMA Custom Guidelines:
   a. Comply with guidelines of NAAMM HMMA 865 for Sound Control Hollow Metal Doors and Frames.
   b. Performance Level 2 - Moderate Duty, in accordance with NAAMM HMMA 805.
   c. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
   d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 35, minimum, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
3. Door Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
4. Door Thickness: As required to meet acoustic requirements indicated.
5. Door Finish: Factory finished.
6. Sound Seals: Integral, in door and/or frame. Continous, adjustable, neoprene compression seal
7. Opening Force of Sound-Rated Doors, Non-Fire-Rated: 5 pounds, maximum, in compliance with ADA Standards.
8. Hardware:
   a. Factory Installed by door supplier
   b. Function as noted in Section 08 7100 - Door Hardware
9. Door and Frame to be assembled and adjusted in factory, and shipped as single unit. No field assembly of Sound-Rated doors and frames is allowed.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Welded frames to be factory primed and field finished. Knock-down frames to be factory finished..

C. Exterior Door Frames: Face welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
2. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Face welded type and knock-down type. See door schedule for additional information
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

E. Door Frames, Fire-Rated: Knock-down type.
1. Fire Rating: Same as door, labeled.

F. Sound-Rated Door Frames: Face welded type.
1. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

J. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: As selected by Architect from manufacturer's full range.

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
   1. Style: Sightproof inverted V blade.
   2. Fasteners: Exposed, tamper proof fasteners.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

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 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install prefinished frames after painting and wall finishes are complete.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Install door hardware as specified in Section 08 7100.

G. Comply with glazing installation requirements of Section 08 8000.

H. Coordinate installation of electrical connections to electrical hardware items.

I. Touch up damaged factory finishes.

3.04 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 measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

B. ASTM E413 - Classification for Rating Sound Insulation; 2016.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

F. 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. Samples: Submit two samples of door veneer, 6 by 6 inch in size illustrating wood grain, stain color, and sheen.

E. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. 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. Marshfield DoorSystems, Inc: www.marshfielddoors.com/#sle.
   2. Oregon Door; Architectural Series: www.oregondoor.com/#sle.
   3. Vancouver Architectural Doors: www.vancourverdoorco.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Sound-Rated Wood Doors:
   1. Masonite Architectural; Acoustically-Rated Door Solutions: www.architectural.masonite.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS AND PANELS

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.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches 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) labeled without any visible seals when door is open.
   3. Sound-Rated Doors: Minimum STC of 35 minimum, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
      a. Hardware:
         1) Factory installed by door supplier
         2) Function as noted in Section 08 7100 - Door Hardware
      b. Door and Frame to be assembled and adjusted in factory, and shipped as single unit. No field assembly of Sound-Rated doors and frames is allowed.
   4. Wood veneer facing with factory transparent finish.

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.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Maple, veneer grade in accordance with quality standard indicated, quarter cut, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. "Running Match" each pair of doors and doors in close proximity to each other.
   3. Stain: to match Architect's sample

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 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. Transparent:
      a. System - 5, Varnish, Conversion.
      b. Stain: As selected by Architect.
      c. Sheen: Semigloss.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1113.

B. Glazing: See Section 08 8000.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: See Section 08 7100.

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.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

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.

E. Coordinate installation of glazing.

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.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 3100

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. UL (FRD) - Fire Resistance Directory; current edition.

1.04 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.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Panel Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   2. Size: 12 by 12 inches or as indicated on drawings
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units in Wet Areas:
   1. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size: 12 by 12 inches.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Ceiling-Mounted Units:
   1. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   3. Size - Other Ceilings: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Size: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Style: Frame concealed by door panel.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
2. Door Style: Single thickness with rolled or turned in edges.
3. Frames: 16 gauge, 0.0598 inch, minimum thickness.
4. Heavy Duty Single Steel Sheet Door Panels: 14 gauge, 0.0747 inch, minimum thickness.
5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
   a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
6. Steel Finish: Primed.
7. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
8. Hardware:
   a. Hardware for Fire-Rated Units: As required for listing.
   b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
   c. Latch/Lock: Screw driver slot for quarter turn cam latch.
   d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
   e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

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 3613

SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Four-fold side opening sectional metal doors, electrically operated - Bid Alternate

C. Operating hardware and supports.

D. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough wood framing for door opening.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 26 0533.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.

D. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. 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; 2017.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

J. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

L. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; 2011.

M. ITS (DIR) - Directory of Listed Products; current edition.

N. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

O. NEMA MG 1 - Motors and Generators; 2014.

P. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

S. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, hardware, and accessories.

D. Samples: Submit two panel finish samples, 12 x 12 inch in size, illustrating color and finish.

E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Comply with applicable code for motor and motor control requirements.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Final Acceptance.

C. Warranty: Include coverage for electric motor and transmission.

D. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Themospan Model 200-20 (Doors on North Wall) and Model 452 Full View Aluminum (Doors on South Wall) manufactured by Wayne-Dalton.

B. Other Acceptable Manufacturers - Sectional Doors:
1. Overhead Door Company: www.overheaddoor.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

C. Bid Alternate - Four-Fold Side Opening Metal Doors:
1. Clearfold Doors: www.clearfold.com
2. Door Engineering: www.doorengineering.com
3. Electric Power Door: www.electricpowerdoor.com
4. Jewers Doors: www.jewersdoors.us
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DOORS

A. Steel Doors: Flush steel, insulated; follow the roof pitch operating style with track and hardware; complying with DASMA 102, Commercial application.
1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
2. Door Nominal Thickness: 2 inches thick.
3. Thermal Resistance: R-value of 17, minimum, for overall thickness indicated.
4. Exterior Finish: Factory finished with polyester baked enamel; color as selected from manufacturers standard line.
5. Interior Finish: Factory finished with polyester baked enamel; color as selected from manufacturers standard line.

6. Glazed Lights: Full panel width, rows as shown on drawings; set in place with resilient glazing channel.
7. Operation: Electric
8. Door Panels: Steel construction; outer steel sheet of 20 gage, 0.0359 inch minimum thickness, flush profile; inner steel sheet of 28 gage, 0.015 inch minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.
9. Window Frame: Manufacturers standard, finish to match.
10. Glazing: Fully tempered glass; insulated; clear; 1/2 inch thick.

2.03 ALUMINUM DOORS

A. Aluminum Doors: Stile and rail aluminum with solid and glazed panels; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   2. Door Nominal Thickness: 2 inches thick.
   3. Thermal Resistance: R-value of 3 minimum
   4. Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
   5. Glazed Lights: Full panel width, all rows except bottom; set in place with resilient glazing channel.
   6. Electric Operation: Electric control station.

B. Door Panels: Paneled aluminum construction; extruded aluminum stiles and rails; infill panels of sheet aluminum; stile and rail joints internally reinforced with cast aluminum brackets; rabbeted weather joints at meeting rails.

C. Window Frame: Manufacturers standard, finish to match.

D. Glazing: Fully tempered glass; insulated glass units; clear; 1/2 inch overall thickness.

2.04 BID ALTERNATE - FOUR-FOLD SIDE OPENING METAL DOORS

A. Steel Doors: Stile and rail steel with solid and glazed panels, insulated; side opening operating style with track and hardware; steel complying with ASTM A1011/A1011M.
   1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   2. Door Nominal Thickness: 1-5/8 inch thick.
   3. Overall Door Height: As indicated on drawings.
   4. Overall Door Width: As indicated on drawings.
   5. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
   6. Interior Finish: Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
   7. Glazed Lights: As shown on drawings, set in place with resilient glazing channel.
   8. Operation: Automatic, electric powered.

B. Door Panels: Steel construction, with steel sheet having 14 gauge, 0.0747 inch minimum thickness and welded joints; rabbeted weather joints at meeting rails.

C. Glazing: Fully tempered glass or laminated glass; insulated glass units; clear; 1 inch overall thickness.

2.05 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch minimum thickness; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Four-Fold Operating Door Hardware: Provide guide tracks and brackets, trolleys, center guides, and jamb and fold hinges as required for opening layout.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

I. Lock Cylinders: See Section 08 7100.

2.06 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, stucco embossed surface.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), 5005 alloy, H14 temper, plain surface.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

D. Float Glass: Provide float glass glazing, unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

E. Laminated Safety Glass: ASTM C1172 with at least 0.030 inch thick polyvinyl butyral (PVB) interlayer, and in compliance with safety criteria 16 CFR 1201 Categories 1 and 2, and ANSI Z97.1.

F. Insulation: Foamed-in-place polyurethane, bonded to facing.

2.07 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Conform to UL 325; provide products listed by UL (DIR).
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
      a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
   3. Motor Rating: 1/2 hp; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 0583 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge as required with momentary-contact control device and Photo-electric sensor: One set per door. Omron Model E3K-R10K4, no exceptions

E. Safety Edge: Located at bottom (leading edge) of sectional door panel, full width (full height on four-fold doors); electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

1. Manufacturers:
    a. Miller Edge, Inc: www.MillerEdge.com/sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

F. Provide radio control antenna detector.

G. Hand Held Transmitter: Digital control, resettable. Provide separate unit for each door. Linear AP-5, no exceptions.

H. Down Door Buzzer: Provide a "door down" annunciator for all overhead doors. Inter-tie the operation of annunciator to PLC (programmable logic controller of the tap out system). Annunciator to sound when any door descends.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install perimeter trim and closures.

G. Mount bottom the reflector for the photo-electric switch at 18 inches above the top of concrete slab. Mount the photo cell at 42 inches, diagonally across the opening, aimed at an angle to hit the reflector so as to intercept the fire apparatus body if in the door opening.

H. Mount remote control receiver for Linear AP-5 transmitters at +60” A.F.F. Individual Up/Down/Stop Button Controls and the AP-5 Radio Receivers are to be mounted on the left side of each overhead door, when facing the doors from the inside of the Bays. Verify exact locations with Owner prior to installation.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Final Acceptance.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 08 4500 - Translucent Wall and Roof Assemblies: Clerestory windows at Apparatus Bay

B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details and thermal performance information.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 by 12 inches in size illustrating finished aluminum surface, glass, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer 451 T; www.kawneer.com.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc: www.arcadiainc.com/#sle.
   2. OldCastle Building Envelope www.obe.com
   3. EFCO, a Pella Company: www.efcocorp.com/#sle

C. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Medium Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer Insulclad 360; www.kawneer.com.
   2. Thickness: 2-1/4 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. EFCO, a Pella Company: www.efcocorp.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Finish: Class I color anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without

causing detrimental effect to system components, anchorages, and other building elements.

7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Design Wind Loads: Comply with requirements of applicable code.
b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
3. Overall U-value Including Glazing: 0.80 Btu/(hr sq ft deg F), maximum.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
2. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches.
2. Top Rail: 4 inches wide.
3. Vertical Stiles: 4-1/2 inches wide.
4. Bottom Rail: 10 inches wide.
5. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

F. Sealant for Setting Thresholds: Non-curing butyl type.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 8000.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Color: Clear.

2.07 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: Storefront manufacturer's standard type to suit application.

1. Finish on Hand-Contacted Items: Polished stainless steel.
2. For each door, include butt hinges, pivots, pull handle, exit device, and closer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Final Acceptance.

END OF SECTION

SECTION 08 5113

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with operating sash.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing frame to weather barrier installed on adjacent construction.

B. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

K. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).

N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

O. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2016.

1.04 SUBMITTALS

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

B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, compliance with U and SHGC values, and installation requirements.

D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Submit two samples of operating hardware.

F. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

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.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: 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 minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Final Acceptance.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - CW PERFORMANCE CLASS WINDOWS

A. Basis of Design: Kawneer Series 5500 Thermal Windows: www.kawneer.com

B. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of CW, and Performance Grade at least as high as specified design pressure.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. EFCO, a Pella Company: www.efcocorp.com.
   2. OldCastle Building Envelopes: www.obe.com

D. Substitutions: See Section 01 6000 - Product Requirements.

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Operable Units: Double weatherstripped.
   2. Provide units factory glazed.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Performance Requirements: Provide products that comply with the following:
   1. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 9.19 psf.
   3. Air Leakage: Maximum of 0.1 cu ft/min sq ft per unit area of outside frame dimension, with 6.27 psf differential pressure when tested in accordance with ASTM E283.
   4. Condensation Resistance Factor of Frame: 70, measured in accordance with AAMA 1503.
   5. Overall U-value, Including Glazing: 0.35, maximum, measured on the window size required for this project.

C. Outswinging Casement Type:
   1. Construction: Thermally broken.
   2. Provide screens.
   3. Glazing: 1" units, as specified in Section 08 8000
   4. Exterior Finish: Class I natural anodized.
   5. Interior Finish: Class I natural anodized.
   6. Opening Limit: Provide minimum net clear width of 20 inches

2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): CW.

B. Design Pressure (DP): In accordance with applicable codes.

C. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.

E. Air Leakage: 0.1 cfm/sq ft maximum leakage per unit area of outside window frame dimension when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.

F. Condensation Resistance Factor of Frame: 70, measured in accordance with AAMA 1503.

G. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

H. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 34, when tested in accordance with ASTM E90 and ASTM E1332.

2.04 COMPONENTS

A. Frames: 2.5 inch wide by 4 inch deep profile; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Glazing: See Section 08 8000.

C. Sills: extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.

D. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
   1. Hardware: Spring loaded steel pins; four per screen unit.
   2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
   3. Frame Finish: Same as frame and sash.

E. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

F. Fasteners: Stainless steel.

G. Glazing Materials: See Section 08 8000.

H. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.06 HARDWARE

A. Sash lock: Lever handle with cam lock.

B. Operator: Geared rotary handle fitted to projecting sash arms with limit stops.

C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Operator and Exposed Hardware: Enameled to color as selected from manufacturer's standard line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

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

B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sill and sill end angles.

F. Set sill members and sill flashing in continuous bead of sealant.

G. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Install operating hardware not pre-installed by manufacturer.

I. Install glass in accordance with requirements specified in Section 08 8000.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
   1. Perform tests on three individual windows in designated locations as directed by Architect.
   2. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
   3. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.
B. Hardware for fire-rated doors.
C. Electrically operated and controlled hardware.
D. Lock cylinders for doors that hardware is specified in other sections.
E. Thresholds.
F. Weatherstripping and gasketing.
G. Gate locks.

1.02 RELATED REQUIREMENTS

A. Section 08 0671 - Door Hardware Schedule: Schedule of door hardware sets.
B. Section 08 1113 - Hollow Metal Doors and Frames.
C. Section 08 1416 - Flush Wood Doors.
D. Section 08 3613 - Sectional Doors: Door hardware, except cylinders.
E. Section 08 4313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
F. Section 28 1000 - Access Control: Electronic access control devices.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
B. BHMA (CPD) - Certified Products Directory; 2017.
C. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.
D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.
E. BHMA A156.3 - American National Standard for Exit Devices; 2014.
F. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
G. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.
H. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.
I. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
J. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.
K. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.
L. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.
M. BHMA A156.21 - American National Standard for Thresholds; 2014.
N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.
O. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.
P. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
Q. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
R. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.
S. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

T. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

U. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

V. ITS (DIR) - Directory of Listed Products; current edition.

W. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

Y. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

AA. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

AB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:
   1. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Architect.
      d. Installer's Architectural Hardware Consultant (AHC).
      e. Hardware Installer.
      f. Owner's Security Consultant.
   2. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Access control requirements.
      b. Key control system requirements.
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

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

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).

2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
3. List groups and suffixes in proper sequence.
4. Provide complete description for each door listed.
5. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
6. Include account of abbreviations and symbols used in schedule.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Final Acceptance.
1. Closers: Five years, minimum.
2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Applicable provisions of NFPA 101.

4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
6. Listed and certified compliant with specified standards by BHMA (CPD).
7. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
8. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
9. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
1. Refer to Section 28 1000 for additional access control system requirements.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule.

F. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
   a. Self-drilling (Tek) type screws are not permitted.
3. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
4. Fire-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
5. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.02 HINGES

A. Manufacturers:
1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hager Companies: www.hagerco.com/#sle.
3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   a. Provide hinge width required to clear surrounding trim.
2. Provide hinges on every swinging door.
3. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
4. Provide ball-bearing hinges at each door with closer.
5. Provide following quantity of butt hinges for each door:
   a. Doors From 60 inches High up to 90 inches High: Three hinges.
   b. Doors 90 inches High up to 120 inches High: Four hinges.

2.03 FLUSH BOLTS

A. Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch, minimum.

2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
    a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
3. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.

2.04 EXIT DEVICES

A. Manufacturers:
1. Corbin Russwin or Sargent; an Assa Abloy Group company; ED4000/ED5000 Series, 80 Series: www.assaabloydss.com/#sle.
2. Von Duprin, an Allegion brand; 35A/98 XP Series: www.allegion.com/us/#sle.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
2. Provide cylinder with cylinder dogging or locking trim.
3. Provide exit devices properly sized for door width and height.
4. Provide strike as recommended by manufacturer for application indicated.
5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.05 ELECTRIC STRIKES

A. Electric Strikes: Comply with BHMA A156.31, Grade 1.
1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
3. Provide field selectable Fail Safe/Fail Secure modes.
4. Provide transformer and rectifier as necessary for complete installation.

2.06 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide standard, conventional, full size interchangeable core (FSIC), and small format interchangeable core (SFIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.
4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.07 CYLINDRICAL LOCKS

A. Manufacturers:
1. Corbin Russwin or Sargent; an Assa Abloy Group company; CL3300 Series, 10 Line: www.assaabloydss.com/#sle.
2. Schlage, an Allegion brand; ND Series: www.allegion.com/us/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    a. Finish: To match lock or latch.
5. Provide a passage lockset for swinging door where hardware set is not indicated.
6. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.08 MORTISE LOCKS

A. Manufacturers:

1. Corbin Russwin or Sargent; an Assa Abloy Group company; ML2000 Series, 8200 Series: www.assaabloydss.com/#sle.
2. Schlage, an Allegion brand; L9000 Series: www.allegion.com/us/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
1. Latchbolt Throw: 3/4 inch, minimum.
2. Deadbolt Throw: 1 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
a. Finish: To match lock or latch.

2.09 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
3. Trimco: www.trimcohardware.com/#sle.
4. Ives, an Allegion brand: www.allegion.com/us/#sle.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
a. Edges: Square, unless otherwise indicated.
3. Material: Aluminum, unless otherwise indicated.
4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
5. On solid doors, provide matching door pull and push plate on opposite faces.

2.10 COORDINATORS

A. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
1. Type: Bar, unless otherwise indicated.
2. Material: Aluminum, unless otherwise indicated.
3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.11 CLOSERS

A. Manufacturers; Surface Mounted:
1. Corbin Russwin, Norton, or Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. DORMA USA, Inc; ____: www.dorma.com/#sle.
3. LCN, an Allegion brand: www.allegion.com/us/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Provide door closer on each fire-rated and smoke-rated door.
a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
5. At corridor entry doors, mount closer on room side of door.
6. At outswinging exterior doors, mount closer on interior side of door.

2.12 KICK PLATES

A. Manufacturers:

1. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
2. Ives, an Allegion brand: www.allegion.com/us/#sle.
3. Trimco: www.trimcohardware.com/#sle.

B. Kick Plates: Provide along bottom edge of push side of every door, except aluminum storefront and glass entry doors, unless otherwise indicated.
1. Size: 12 inch high by 2 inch less door width (LDW) on push side of door.

2.13 DOOR HOLDERS

A. Door Holders: Comply with BHMA A156.16, Grade 1.
1. Type: Lever, or kick down stop, with rubber bumper at bottom end.
2. Material: Aluminum.

2.14 WALL STOPS

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
3. Trimco: www.trimcohardware.com/#sle.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Provide wall stops to prevent damage to wall surface upon opening door.
2. Type: Bumper, concave, wall stop.
3. Material: Aluminum housing with rubber insert.

2.15 THRESHOLDS

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at interior doors for transition between two different floor types, and between Apparatus Bay and other spaces, unless otherwise indicated.
2. Provide threshold at each exterior door, unless otherwise indicated.
3. Provide thermally broken threshold
4. Type: Ramped, accessible with maximum 1:12 slope.
5. Material: Aluminum.
6. Threshold Surface: Fluted horizontal grooves across full width.
7. Field cut threshold to profile of frame and width of door sill for tight fit.
8. Provide non-corroding fasteners at exterior locations.

2.16 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. National Guard Products, Inc: www.ngpinc.com/#sle.
3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Adjustable.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
5. Provide door bottom sweep on each exterior door, unless otherwise indicated.
6. Provide sound-rated gasketing and automatic door bottom on doors indicated as "Sound-Rated", "Acoustical", or with "Sound Transmission Class (STC) rating"; fabricate as continuous gasketing, do not cut or notch gasketing material.

2.17 LATCH PROTECTOR

A. Latch Protector: Provide on door to protect latch from being tampered with while in locked position.
   1. Type: Standard latch protector.
   2. Material: Stainless steel.

2.18 ROLLER LATCH

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Ives, an Allegion brand: www.allegion.com/us/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Roller Latch: Provide on doors to Apparatus Bay
   1. Location: Mount roller latch at lock and strike of door and frame.
   2. Material: Aluminum.

2.19 SILENCERS

A. Manufacturers:
   1. Ives, an Allegion brand: www.allegion.com/us/#sle.
   2. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.20 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
   2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
      a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
   3. Exceptions:
      a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
      b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
      c. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
      d. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   3. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Push Plates/Pull Bars: 42 inch.
      c. Exit Devices: 40-5/16 inch.

E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 CLEANING

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

C. Section 08 1433 - Stile and Rail Wood Doors: Glazed lites in doors.

D. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

E. Section 08 5113 - Aluminum Windows: Glazing furnished by window manufacturer.

F. Section 08 8300 - Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.

E. ASTM C1036 - Standard Specification for Flat Glass; 2016.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

1.04 SUBMITTALS

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

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 9 by 9 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agc-yourglass.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Etched Glass Manufacturers:
   1. AGC Glass North America, Inc; Matelux: www.agcglass.com/#sle.
   2. GGI - General Glass International; Satin Etched: www.generalglass.com/#sle.
   3. Walker Glass Company Ltd; Walker Textures - Acid-Etched Glass: www.walkerglass.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of Oregon Structural Specialty Code code.
   4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   5. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.
   6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Any of the manufacturers specified for float glass.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   6. Color: Black.
   7. Purge interpane space with dry air, hermetically sealed.

C. Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Optigray by Vitro Glazing or approved manufacturer's equal.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   5. Total Thickness: 1 inch.
   6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
   7. Visible Light Transmittance (VLT): 50 percent, nominal.
   8. Solar Heat Gain Coefficient (SHGC): 0.30, nominal.

9. Glazing Method: Wet/dry glazing method, preformed tape and sealant.

D. Insulating Glass Units: Acid etched, double glazed.
1. Applications: At locations noted as "Frosted".
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Optigray by Vitro Glazing or approved manufacturer's equal.
b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Acid Etched float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
b. Etching level: Satin, as approved by Architect and Owner
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
7. Visible Light Transmittance (VLT): 50 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.30, nominal.
9. Glazing Method: Wet/dry glazing method, preformed tape and sealant.

E. Insulating Glass Units: Safety glazing.
1. Applications:
a. Glazed lites in exterior doors.
b. Glazed sidelights and panels next to doors.
c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on drawings.
2. Space between lites filled with air.
3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
4. Total Thickness: 1 inch.
5. Thermal, SHGC, and VLT requirements to match project standard insulated glass unit.

2.05 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
a. Glazed lites in doors, except fire doors.
b. Glazed sidelights to doors, except in fire-rated walls and partitions.
c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

C. Etched Glass: Etched patterns on glass as full-coverage.
1. Applications: As indicated on drawings as Frosted.
2. Glass Type: Monolithic; tempered safety glass; clear glass.
3. Thickness: 1/4 inch, nominal.
4. Pattern: Satin, As selected by Architect from manufacturers standard line.
5. Finish: F1 - Patterned one side; ASTM C1036.
6. Clear Glass: Clear float glass

2.06 GLAZING COMPOUNDS

A. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

B. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Manufacturers:
   1. BASF Corporation: www.basf.com/#sle.
   2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - WET/DRY GLAZING METHOD (PREFORMED TAPE AND SEALANT)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

C. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

D. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

E. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

F. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
   1. Place glazing tape on glazing pane of unit with tape flush with sight line.

G. Fill gap between glazing and stop with _____ type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Final Acceptance in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Final Acceptance.

END OF SECTION

SECTION 08 8300

MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Tempered safety glass.

1.02 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

C. GANA (GM) - GANA Glazing Manual; 2009.

D. GANA (SM) - GANA Sealant Manual; 2008.

1.03 SUBMITTALS

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

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.05 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass; at Exercise Room: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch.
   2. Size: As indicated on drawings.

2.02 ACCESSORIES

A. Mirror Attachment Accessories: Stainless steel J-profile channels.

B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
   1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.
   2. Volatile Organic Content (VOC): Less than 7 percent by weight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

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 08 1113: Door louvers.

B. Section 09 9113 - Exterior Painting: Field painting.

C. Section 23 3100 - HVAC Ducts and Casings: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

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. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

PART 2 PRODUCTS

2.01 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Blades: Straight.
   2. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   3. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
   4. Aluminum Finish: Class I natural anodized; finish welded units after fabrication.

C. Operable Louvers: Operable horizontal blades, extruded aluminum construction.

1. Free Area: As noted on mechanical drawings
2. Operation: Actuator provided in HVAC control system.
3. Movable Blades: Straight, pivoted at, with vinyl, rubber, or polyethylene blade edge and jamb seals; rattle-free linkage.
4. Frame: Depth as indicated on drawings, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
5. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
6. Aluminum Finish: Class I natural anodized; finish welded units after fabrication.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Stainless Steel: ASTM A666, Type 304, soft temper, smooth surface, No. 4 brushed finish.

2.03 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

D. Fasteners and Anchors: Galvanized steel.

E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

F. 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.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Coordinate with installation of mechanical ductwork.

F. Coordinate with installation of louver actuators.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal suspension systems for gypsum ceilings.
B. Gypsum sheathing.
C. Cementitious backing board.
D. Gypsum wallboard.
E. Joint treatment and accessories.
F. Acoustic (sound-dampening) wall and ceiling board.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Building framing.
B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
C. Section 07 2100 - Thermal Insulation: Acoustic insulation.
D. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
E. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2018b.
F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.
I. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017a.
J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
N. ASTM E413 - Classification for Rating Sound Insulation; 2016.
O. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on gypsum board, accessories, joint finishing system, and suspension system..

PART 2 PRODUCTS

2.01 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com.
   5. 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. Use Type X board, unless otherwise noted.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
      b. Mold resistant board is required restrooms, except in wet areas as noted below.
   4. 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.
   5. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

C. Backing Board For Wet Areas:
   1. Application: Surfaces in wet areas including tub and shower surrounds and shower ceilings, and behind sinks.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. 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.
      a. Thickness: 1/2 inch.
      b. Products:
         1) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
         2) USG Corporation: www.usg.com/#sle.
         3) Substitutions: See Section 01 6000 - Product Requirements.
   4. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
      a. Standard Type: Thickness 5/8 inch.

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 and as noted.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Type: Regular and Type X, in locations indicated.
   4. Type X Thickness: 5/8 inch.
   5. Regular Board Thickness: 5/8 inch.
   6. Edges: Tapered.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 1/2 inch.
   3. Edges: Tapered.

F. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper-faced, high-density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Products:
      a. National Gypsum Company; Gold Bond SoundBreak XP Gypsum Board: www.nationalgypsum.com/#sle.
      b. QuietRock 530; www.quietrock.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

G. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
   2. Types: Regular, in locations indicated.
   3. Regular Type Thickness: 1/2 inch.
   4. Edges: Tapered.
   5. Products:
      a. American Gypsum Company; Exterior Soffit Gypsum Wallboard Type X: www.americangypsum.com/#sle.
      b. Continental Building Products; Soffitboard Type X.
      c. Georgia-Pacific Gypsum; ToughRock Fireguard C Soffit Board: www.gpgypsum.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL SUSPENSION SYSTEMS

A. Suspension systems may be used for gypsum board ceilings in place of framing members, except at Dorms or otherwise indicated on drawings. Confirm proposed locations of suspended gypsum board ceilings with Architect.

B. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG Corporation: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Description: Commercial quality, cold-rolled steel suspension system designed for attachment of gypsum board, consisting of main and cross tees with suspension wire supports.

D. Materials:
   1. Main Tees: 1 1/2 inches high by maximum possible length, cold rolled steel with hot-dipped galvanized coating
   2. Cross Tees: 1 1/2 inches high by 48 inches long, cold rolled steel with hot-dipped galvanized coating
   3. Locking moldings - provided as required to meet installation requirements
   4. Wall Molding: 1 inch high channel molding, maximum possible length
   5. Accessories: Provide manufacturer's standard clips and splice plates as required for full installation
   6. Wire: Hanger wire, 12 ga galvanized
   7. Gypsum Board Screws:
      a. Self-drilling, self-tapping steel screws

1) For steel framing less than 0.03 inch thick: Comply with ASTM C1002
2) For steel framing from 0.033 inch thick to 0.112 inch thick: Comply with ASTM C954
3) Provide Type S or Type S-12 screws

E. System Structural Requirements:
1. Main Beam shall be heavy duty per ASTM C 635.
2. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction.
3. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
2. Tape Thickness: 1/4 inch.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. Expansion Joints:
a. Type: V-shaped metal with factory-installed protective tape.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Setting type, field-mixed.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Nails for Attachment to Wood Members: ASTM C514.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Suspended Ceilings and Soffits: Space framing and furring members as permitted by standard.
1. Level ceiling system to a tolerance of 1/1200.
2. Laterally brace entire suspension system.
3. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 16 sq. ft. or as required to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
4. Space main tee members a maximum span of 48” on center (or as specified by the UL Fire Resistance Directory)
5. Space cross tees as recommended by system manufacturer
6. Install trim, and similar accessories as necessary and as applicable to meet project requirements where indicated on drawings.

7. Install control joints at locations of properly detailed control joints, including additional cross tees as necessary, per direction of architect and/or design professional.
8. Finish boards as described to achieve 'Level of Finish' specified.

B. Studs: Space studs as indicated.
1. Extend partition framing as indicated on drawings.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet accessories.
5. Future accessories, at locations as indicated on drawings

3.03 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.
1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 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. Single-Layer Non-Rated: Install gypsum board perpendicular to framing, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

F. Cementitious Backing Board: Install over wood framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. 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.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 3000

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for wall applications.

B. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
   2. 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; 1999 (Reaffirmed 2010).
   3. 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 2010).
   4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
   5. 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).
   6. 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).
   7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
   8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
   9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
   10. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
   11. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
   12. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
   13. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).
   14. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).

B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2016.

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. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Provide minimum two tiles and grout color chart.

E. 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, but not less than 20 of each type.

1.05 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Ceramic Tile: ANSI A137.1, standard grade.
   1. Size: 4 by 12 inch, nominal.
   2. Shape: Rectangle.
   3. Edges: Square.
   4. Surface Finish: Glossy.
   5. Color(s): As indicated on drawings.
   6. Products:
      a. Design and Direct Tile; Westminster Tile, Classic Tile Series: http://www.designanddirectsource.com/.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Trim: satin nickel colored anodized aluminum, style and dimensions listed below, for setting using tile mortar or adhesive.
   1. Applications:
      a. Top and bottom edges of wall tile: Schluter Jolly.
      b. Floor to wall joints.
   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. LATICRETE International, Inc: www.laticrete.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
   1. Products:
      a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Where indicated.

2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
   a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

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. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, 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.

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 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244.

3.05 CLEANING

A. Clean tile and grout surfaces.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Suspended gypsum board ceilings

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.04 SUBMITTALS

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

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
   1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Pattern: "E" - lightly textured.
      b. Basis of Design: Armstrong "Ultima"

2. Size: 24 by 48 inch.
3. Thickness: 3/4 inch.
4. Panel Edge: Square.
5. Color: White.
6. Suspension System: Exposed grid.

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
1. Application(s): Seismic.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Finish: Baked enamel.
5. Color: White.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.
1. Size: As required for installation conditions and specified Seismic Design Category.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size. See drawings for direction of grid.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 5426

SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood veneer panels.

B. Metal suspension system.

1.02 RELATED REQUIREMENTS

A. Section 09 5100 - Acoustical Ceilings: Metal suspension systems.

1.03 REFERENCE STANDARDS

A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

B. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

C. CISCA (WC) - Wood Ceilings Technical Guidelines; 2009.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on wood ceiling components and suspension system components.

D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood ceiling components to project site in original, unopened packages.

B. Store in fully enclosed space, flat, level and off the floor.

1.06 FIELD CONDITIONS

A. Do not install suspended wood ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.

B. Maintain room temperature between 60 degrees F and 75 degrees F and relative humidity between 35 to 55 percent before, during, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Suspended Wood Ceilings:
   1. Armstrong World Industries, Inc; Woodworks: www.armstrongceilings.com/#sle.
   2. _____.

2.02 SUSPENDED WOOD CEILING SYSTEM

A. Performance Requirements:
   1. Design for maximum deflection of 1/360 of span.
   2. Design to resist seismic load by using practices specified in ASTM E580.

B. Wood Veneer Panels: Composite wood core with wood veneer finish.
   1. Panel Size: 24 by 48 inches.
   2. Panel Thickness: 3/4 inch.
   3. Veneer Species: As selected from manufacturer's full line.

a. Factory Finish: Clear sealer.

4. Acoustical Fabric: Manufacturer's standard non-woven fabric.
5. Attachment to Suspension Grid: Lay-in, concealed grid.
6. Edge Profile: Reveal.
7. Suspension System: See Section 09 5100.
8. Products:
   a. Armstrong; Woodworks Vector 6482-W1.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Accessories: Manufacturer's standard accessories for installation method indicated, seismic requirements and above-ceiling accessibility.

2.03 FABRICATION

A. Shop fabricate wood ceiling components to the greatest extent possible.

B. Fabricate components to allow access to ceiling plenum as required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.

C. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

A. General: Install suspended wood ceiling system in accordance with CISCA (WC).

B. Suspension System:
1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
6. Do not eccentrically load system or induce rotation of runners.

C. Wood Ceiling:
1. Install wood ceilings in accordance with manufacturer's instructions.
2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
3. Install components in uniform plane, and free from twist, warp, and dents.
4. Cut to fit irregular grid and perimeter edge trim.
5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.
6. Install clips, stabilizer bars, and other attachments as indicated to secure wood ceiling components tight to the grid system.
7. Install acoustical backer above wood ceiling components; fit tight between grid members.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 CLEANING

A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004, with Editorial Revision (2014).

D. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

E. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

F. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015, with Editorial Revision (2016).

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

H. RFCI (Resilient Floor Covering Institute) - FloorScore certification

1.04 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. Evidence of Floorscore certification for products and compliance with VOC levels for adhesives.

D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.

E. 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 Flooring Material: 140 square feet of each type and color.

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 and 90 degrees F.

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 to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile: Surface-decorated, with wear layer.
   1. Manufacturers:
      a. Mannington; No Reservations Xpress: www.manningtoncommercial.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Plank Tile Size: 6 by 36 inch.
   4. Wear Layer Thickness: 0.020 inch.
   5. Total Thickness: 0.1575 inch.
   6. Color: As indicated on drawings.

2.02 STAIR COVERING

A. Stair Treads and Risers: Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers and products:
      a. Burke Flooring; Endura Stair Treads: www.burkeflooring.com/#sle.
      b. Roppe Corporation; Rubber Stair Treads: www.roppe.com/#sle.
      c. Mohawk 'Master Step' with Contrasting Nosing.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Nosing: Square.
   5. Striping: 2 inch wide contrasting color abrasive strips.
   6. Texture: Raised.
   7. Color: To be selected by Architect from manufacturer's full range.

B. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
   1. Nominal Thickness: 0.080 inch.

2.03 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove designated RB1 on drawings.
   1. Manufacturers:
      a. Burke Flooring; Commercial Wall Base - TS: www.burkeflooring.com/#sle.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      c. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated on drawings.
   7. Accessories: Premolded external corners and internal corners.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. VOC Limits: less than 50 grams/Liter.

C. Moldings, Transition and Edge Strips: Metal.

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.

B. 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 resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.

D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

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.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Install stringers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6566

RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied polyurethane flooring over rubberized base mat.

B. Rubber sheet flooring, adhesively installed.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.06 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Connor Sports; PowerDek HD: www.connorsports.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Rubber Sheet Flooring: Two-layer vulcanized rubber, applied in two layers.
   1. Thickness: Minimum 18 mm.
   2. Surface Texture: Smooth.
   3. Color: As selected from manufacturer's standard range.

2.02 ACCESSORIES

A. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. 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 athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
   1. Basemat
      a. Unroll flooring and allow to relax before beginning installation.
      b. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
      c. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
      d. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
      e. Weld seams using techniques and equipment recommended by manufacturer.
   2. Surface Layer:
      a. Unroll flooring and allow relaxing overnight while maintaining a constant room temperature.
      b. Thoroughly mix two-component polyurethane adhesive per manufacturer’s instructions and apply directly to rubber mat.
      c. Install flooring into freshly applied adhesive, scribing and fitting neatly at walls, around columns and around door frames. Use matching urethane caulk at tight fit locations.
      d. Set and hold joints with masking tape.
      e. Roll floor in multiple directions with a 100lb (45.4 kg) roller to ensure contact with adhesive & eliminate trapped air.
      f. Clean any adhesive that migrates between seams with recommended product.
      g. After rolling, and before adhesive dries, clean adhesive from surface, weight seams and perimeter at wall.
      h. Continue installing runs as described above to completion.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

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; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color for each carpet color selected.

1.04 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Interface, Inc: www.interface.com/#sle.
   2. Milliken & Company: www.milliken.com/#sle.
   3. Mohawk Group: www.mohawkgroup.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot.
   1. Product: Per drawings
   2. Tile Size: 24 by 24 inch, nominal.
   3. Primary Backing Material: polyolefin.

2.03 ACCESSORIES

A. Edge Strips: Embossed aluminum, color as selected by Architect.

B. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 8430

SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

B. Mounting accessories.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.

D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.01 WOOD VENEER SOUND-ABSORBING UNITS

A. Manufacturers:
   1. Armstrong; Woodworks Wall Panels: www.armstrongceilings.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Wood Veneer Acoustical Panels for Walls: Medium Density Fiberboard (MDF) core panels with prime grade finished face veneer and non-woven acoustical fabric adhered to back of panel.
   1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   2. Acoustic Back-Up Material: Acoustical Fleece
   3. Panel Size: 24 inches by 48 inches.
   4. Panel Thickness: 3/4 inch.
   5. Surface Veneer Species: Maple.
   6. Mounting: Use fixing clips to attach to wood furring strips anchored to wall substrate.
      a. Edge Profile: Reveal.

2.02 SOUND-ABSORBING UNITS

A. Manufacturers:
   1. MDC; Zintra: www.mdcwall.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Panels for Walls: Polyester, manufacturer's standard core

1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
2. Noise Reduction Coefficient (NRC): 0.45 to 0.95 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
3. Panel Size: 48 inches by 108 inches.
4. Panel Thickness: 1/2 inches.
5. Mounting: Manufacturer's mechanical clip system
6. Color: As indicated

2.03 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

B. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

2.04 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal:

B. Fixing Clips: Manufacturers standard for application as indicated.

C. Furring Strips: 1 by 2 inch wood furring.

D. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

C. Furring Mounted Wood Veneer Panels:
1. For horizontal panel layout, attach furring strip vertically providing 1 inch clearance along length of strip from end walls.
2. For vertical panel layout, attach furring strip horizontally providing 1 inch clearance along length of strip from floor and ceiling.
3. Install furring strip along meeting edges of adjacent panels to ensure they are attached to same furring strip along abutted edge; 24 inch on center, maximum.
4. Install acoustic back-up material between furring as required for application.
5. Adhere first panel from edge to furring strip, and attach subsequent panels using fixing clips.

D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
1. Plumb and level.
2. Flatness.

3.03 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9113

EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed surfaces of steel lintels and ledge angles.

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, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
   7. Floors, unless specifically indicated.
   8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Shop-primed items.

B. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SSPC-SP 1 - Solvent Cleaning; 2015.

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 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.

4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

1.05 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 12 feet long by 12 feet wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate where directed by Architect.

E. Mock-up may remain as part of the work.

1.06 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 and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 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 exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:
1. Behr Process Corporation: www.behr.com/#sle.
2. PPG Paints: www.ppgpaints.com/#sle.
3. Rodda Paint Company: www.roddapaint.com/#sle.
4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required 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. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated on drawings.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including fiber cement siding, primed wood, primed metal, and galvanized metal.
1. Two top coats and one coat primer.
2. Fiber Cement Siding, Primed Wood, Primed Synthetic Trim: Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
3. Primed Metal: Top Coat(s): Exterior Alkyd Enamel; MPI #94 or 96.
4. Galvanized Metal: Top Coat(s): Exterior Alkyd; MPI #9
5. Top Coat Sheen:
a. Eggshell: MPI gloss level 3; use this sheen at all non-metal locations.
b. Gloss: MPI gloss level 6; use this sheen at all metal locations.
6. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 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 for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. 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.

J. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

H. Sand wood, metal, and other surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

D. Touch-up damaged finishes after Final Acceptance.

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. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   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.

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. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Floors, unless specifically indicated.
   7. Ceramic and other tiles.
   8. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SSPC-SP 1 - Solvent Cleaning; 2015.

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 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 in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and wood doors, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

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 and a maximum of 90 degrees F, 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 above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

B. Paints:
1. Behr Process Corporation: www.behr.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.

C. Primer Sealers: Same manufacturer as top coats.

D. 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. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated on drawings.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under, unless otherwise noted.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, plaster, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
3. Primer: As specified under "PRIMERS" below.

B. Restrooms: All interior surfaces to be painted, unless otherwise noted:
1. Two top coats and one coat primer.
2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
3. Primer: As recommended by top coat manufacturer for specific substrate.

C. Dry Fall: Metals; exposed structure and overhead-mounted services in Apparatus Bay and other spaces as indicated, including shop primed structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Shop primer by others.
2. One top coat.
3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
4. Primer: As specified under "PRIMERS" below.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
2. Anti-Corrosive Alkyd Primer for Metal; MPI #79.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 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. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. 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.

H. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. 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.

K. 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.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 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".
   1. Provide completed work matching approved samples for color, texture, and coverage.
   2. Remove, refinish, or repaint work not complying with requirements.

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.

F. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand wood, metal, and other surfaces as recommend by manufacturer lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

END OF SECTION

SECTION 09 9723

CONCRETE AND MASONRY COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Moisture resistant smooth concrete and masonry coatings.

1.02 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2016.

B. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2015.

C. ASTM D6904 - Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry; 2003 (Reapproved 2013).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

F. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

G. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

1.03 SUBMITTALS

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

B. Product Data: Provide data indicating coating materials and _____.

C. Samples: Submit two samples 6 by 6 inch in size illustrating colors for selection.

1.04 FIELD CONDITIONS

A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete and Masonry Coatings:
   1. Sto Corp: www.stocorp.com/#sle.
   2. Textured Coatings of America, Inc: www.texcote.com/#sle.
   3. Substitutions: Section 01 6000 - Product Requirements.

2.02 CONCRETE AND MASONRY COATINGS

A. Provide high-build, weather resistant coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
   1. Salt Spray Resistance: Passes when tested according to ASTM B117 for 2000 hours.
   2. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
   3. Accelerated Outdoor Exposure: Passes when tested according to ASTM G153 for 5,000 hours.

2.03 MATERIALS

A. Coatings - General: Provide complete systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated.

B. Water Based Weather Resistant Smooth Coating: Single component acrylic coating, color pigments, and acrylic polymer.
   1. Dry Film Thickness: 8.4 mils minimum, per coat.
   2. Moisture Resistance: No adhesion loss, discoloration, blistering, cracking, or flaking when tested in accordance with ASTM D2247, 14 day exposure.
   3. Accelerated Weathering: Tested in accordance with ASTM G155; 2,000 hours with no deleterious effects.
   4. Wind Driven Rain Resistance: No water penetration when tested according to ASTM D6904; weight gain less than 0.02 lbs for one coat, weight gain less than 0.09 lbs for two coats.
   5. Water Vapor Transmission: ASTM E96/E96M; 25 perms, maximum.
   6. Color: Clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.

D. Masonry: Verify masonry joints are struck flush.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Concrete and Masonry: Prior to priming, patch holes and indentations and fill cracks with manufacturer's recommended crack repair material.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 1400

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Emergency evacuation maps.

C. Building identification signs.

D. Traffic signs and exterior directional signs.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway of type listed, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 8"x8" inches, unless otherwise indicated.
   5. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   6. Rest Rooms: Identify with pictograms for man/woman, ADA symbols, the text "RESTROOM/SHOWER", and braille.

C. Emergency Evacuation Maps:
   1. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

D. Building Identification Signs:
   1. Use individual metal letters, surface applied, font style as indicated on drawings.
   2. Mount on outside wall in location indicated on drawings.

E. Traffic Signs and Exterior directional signage: Sheet metal, to match Owner standards; locate where indicated on drawings.

2.02 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Radiused.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: As scheduled.
   4. Character Color: Contrasting color.

2.03 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

2.04 NON-TACTILE SIGNAGE MEDIA

A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
   1. Sign Color: Color as selected.
   2. Total Thickness: 1/8 inch.

2.05 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum casting.
   2. Metal Thickness: 1/8 inch minimum.
   3. Letter Height: As indicated on drawings.
   4. Finish: As selected by Architect from manufacturer's full range.
   5. Mounting: Concealed screws.

2.06 TRAFFIC SIGNAGE AND EXTERIOR DIRECTIONAL SIGNAGE

A. Sheet metal panel:
   1. Metal: 18 ga aluminum
   2. Size: As indicated on drawings
   3. Surface Finish: Vinyl Overlay
   4. Text and Typeface: As indicated on drawings

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Final Acceptance; repair or replace damaged items.

END OF SECTION

SECTION 10 2600

WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 08 7100 - Door Hardware: Standard protection plates and trim.

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; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

E. 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. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two sections of corner guards, 6 inches long.
2. Submit two samples of protective wall covering, 6 by 6 inches square.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

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.

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. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, _____ inch thick.
2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
3. Width of Wings: 2 inches.
4. Corner: Square.
5. Color: As indicated.
6. Length: One piece, 48 inches high.

B. Protective Wall Covering:
1. Material: High-impact acrylic-modified vinyl.
2. Thickness: 0.040 inch.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: As selected from manufacturer's standard colors.

C. Doorway Protection:
1. See Section 08 7100 - Door Hardware for standard protective plates and trim.

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.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

D. Start of installation constitutes acceptance of project conditions.

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 above finished floor to 48 inches high.

C. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.

1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
2. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
4. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

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. Under-lavatory pipe supply covers.

D. Diaper changing stations.

E. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

B. Section 08 8300 - Mirrors: Other mirrors.

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.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM C1036 - Standard Specification for Flat Glass; 2016.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bobrick Washroom Equipment: www.bobrick.com
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bradley Corporation: www.bradleycorp.com.
   4. Substitutions: Section 01 6000 - Product Requirements.

B. Diaper Changing Stations:
   1. Bobrick Washroom Equipment: www.bobrick.com
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Substitutions: 01 6000 - Product Requirements.

C. Provide products of each category type by single manufacturer.

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.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Fasteners, Screws, and Bolts: Hot dip galvanized.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Basis of Design: All products by Bobrick unless otherwise noted. See Section 2.01 Manufacturers above for other acceptable manufacturers.

B. Combination Toilet Paper/ Seat Cover Dispenser, Santitary Napkin Disposal: Double roll, recessed, stainless steel unit with pivot hinge, tumbler lock.
   1. Products:
      a. B-35745.
      b. Substitutions: Section 01 6000 - Product Requirements.

C. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 300 C-fold minimum.
   2. Products:
      a. B-359039.
      b. Substitutions: Section 01 6000 - Product Requirements.

D. Combination Towel Dispenser/Waste Receptacle: Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
   1. Towel dispenser capacity: 700 multifold.
   2. Waste receptacle capacity: 12 gallons.
   3. Products:
      a. B-3944.
      b. Substitutions: Section 01 6000 - Product Requirements.

E. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Minimum Capacity: 40 ounces.
   2. Products:
      a. B-4112.
      b. Substitutions: Section 01 6000 - Product Requirements.

F. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 24 inch by 36 inch.
   3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

4. Products:
    a. B-165 2436.
    b. Substitutions: Section 01 6000 - Product Requirements.

G. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
    a. Push/Pull Point Load: 250 pound-force, minimum.
    b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
    c. Length and Configuration: As indicated on drawings.
    d. Products:
        1) 18" Bar: B-5806 x 18.
        2) 30" Bar: B-5806 x 30.
        3) 36" Bar: B-5806-36.
        4) Substitutions: Section 01 6000 - Product Requirements.

H. Shelf: Fixed; 18-ga satin-finished stainless steel, with 3/4" rolled edges, hemmed for safety
1. Dimensions: 6" deep x 18" long
2. Products:
    a. B-296x18
    b. Substitutions: Section 01 6000 - Product Requirements.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 48 by 72 inches, hemmed edges.
3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
4. Color: White.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Folding Bench: Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, rectangular seat.
1. Seat: Teakwood slats secured to supporting frame members with stainless steel screws. Ease edges of each slat.
2. Size: 24" L x 15" D.
3. Products:
    a. Freedom Showers; Folding Shower Bench: www.freedomshowers.com.
    b. Substitutions: Section 01 6000 - Product Requirements.

D. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
1. Length: 18 inches.
2. Products:
    a. B-673 Series.
    b. Substitutions: Section 01 6000 - Product Requirements.

E. Towel Pin: Stainless steel, 3 inch extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.

F. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
    a. B-76717.
    b. Substitutions: Section 01 6000 - Product Requirements.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Construction: 1/8 inch flexible PVC.
      a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Color: White.

2.07 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Stainless steel.
   2. Mounting: Surface.

2.08 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   3. Length: 36 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, and anchorage details.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, and locations of individual fire extinquishers.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, red color.
   4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.02 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Fire Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

C. Cabinet Configuration: Recessed type.
   1. Size to accommodate accessories.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

E. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

F. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

G. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 5143

WIRE MESH STORAGE LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Turn-out Gear lockers.

1.02 REFERENCE STANDARDS

A. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.

B. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan.

D. Samples: Submit two samples 3 inches by 6 inches in size showing color and finish of wire mesh locker material.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Mesh Storage Lockers:
   1. Gear Grid; Standard Mobile and Freestanding Lockers: www.geargrid.com.
   2. Substitutions: Not permitted.

2.02 LOCKER APPLICATIONS

A. Turn-out Gear Lockers: Wire mesh lockers, free-standing, mobile.
   1. Unit Sizes:
      a. Width: 24 inches.
      b. Depth: 24 inches.
      c. Height: 83 inches.
   2. Configuration:
      a. Vertical: Single tier.
      b. Access: Open front and closed back.
      c. Single-sided, double and triple packages as applicable.
   3. Components:
      a. Side Panels: Welded wire mesh with welded steel angle frame.
      b. Backs: Welded wire mesh.
      c. Shelves: Two, constructed of welded wire mesh.
      d. Tops: Individual; Same mesh and framing as wall panels; Flat.
      e. Floors: Welded wire mesh.
   4. Locking: Padlock hasps, for padlocks provided by employer.

2.03 WIRE MESH STORAGE LOCKERS

A. Wire Mesh Lockers: Factory assembled, welded construction, modular assemblies of panels, doors, anchors, hardware, and accessories as required to provide a complete system.

2.04 MATERIALS AND COMPONENTS

A. Welded Wire Mesh: Heavy duty.

1. Material: ASTM A510/A510M uncoated steel wire.
2. Wire Size: 4 gauge, 0.2242 inch.
3. Mesh Opening Size: 3 inch by 3 inch.

B. Framing and Support Members:
1. Material: ASTM A500/A500M cold-formed steel tubing.
2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.

C. Framed Panels:
1. Panel and Door Frames: 1-1/4 inch by 1-1/4 inch; 16 gauge, 0.0598 inch cold-rolled steel angle, welded.
2. Fabrication: Mesh welded to frame.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Coat Hooks: Stainless steel or zinc-plated steel.

F. Number Plates: Provide oval shaped aluminum plates. Form numbers 1 inch high of block font style, in contrasting color.

2.05 FASTENERS

A. Bolts, Nuts and Washers: Hot dip galvanized.

B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

2.06 FINISHES

A. Painted Finish: Manufacturer's standard powder coat finish.
1. Color: Red.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Install fittings if not factory installed.

D. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 7500

FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2016.

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

D. Samples: Submit two __, 4 by 4 inch in size, illustrating pole material, color, and finish.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001.
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Outside Butt Diameter: 7 inches.
   5. Outside Tip Diameter: 4 inches.
   6. Nominal Height: one pole at 35 ft and two poles at 30 ft; measured from nominal ground elevation.
   7. Halyard: Interior type. Rigged to fly one flag

B. Performance Requirements:
   1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 100 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.02 POLE MATERIALS

A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper.

2.03 ACCESSORIES

A. Finial Ball: Stainless steel, 6 inch diameter.

B. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

C. Halyard: 5/16 inch diameter polypropylene, braided, white.

D. Top-of-pole light, manufacturer's standard pole-mounted light. LED. Coordinate requirements with electrical.

2.04 OPERATORS

A. Hand Crank: Removable type.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of ____ inches as indicated.

B. Pole Base Attachment: Flush; steel base with base cover.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: Baked enamel, color as selected.

C. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation.

C. Locate electric control box where indicated.

D. Coordinate installation of conduit and boxes from disconnect to control unit and control unit to motor operating device.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 2000

COMMERCIAL EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laundry appliances.

B. Air Compressors

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 listings at database.ul.com.

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.

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. Extractor Washer:
   1. Provide ten (10) year frame, tub, cylinder, shaft, and housing manufacturer warranty.
   2. Provide three (3) year manufacturer parts warranty

C. Air Compressor:
   1. Provide three (3) year manufacturer warranty

PART 2 PRODUCTS

2.01 LAUNDRY APPLIANCES

A. Extractor Washer
   1. Size: 40 lb dry-weight capacity
   2. Controls: Push button
   3. Cycles: Include preset, programmable cycles
   4. Features: extraction washing, electronic pressure sensor
   5. Finish: Stainless Steel
   6. Manufacturers:
      a. Dexter Laundry; T-600 Washer: www.dexter.com
      b. Substitutions: Not Permitted

2.02 AIR COMPRESSORS

A. Air Compressor
   1. Size: 60 Gallon
   2. Configuration: Vertical
   3. Motor: 5 HP, 1-phase, 230 volt
   4. Number of Cycles: four
   5. Minimum RPM: 550
   6. Manufacturers:

a. Quincy Compressor; Model QT-54: www.quincycompressor.com
b. Substitutions: Not Permitted

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

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 11 3013

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Free-standing Ice Maker

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 listings at database.ul.com.

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).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

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, french door with bottom drawer freezer, and frost-free.
   1. Capacity: Total minimum storage of 24 cubic ft; minimum 25 percent freezer capacity.
   2. Features: Include glass shelves, automatic icemaker, light in freezer compartment, and in-door water and ice dispenser.
   3. Exterior Finish: Stainless steel.
   4. Manufacturers:
      a. Bosch; 800-Series B26FT80SNS: www.bosch-home.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Refrigerator: Free-standing, french door with bottom drawer freezer, and frost-free.
   1. Capacity: Total minimum storage of 20 cubic ft; minimum 25 percent freezer capacity.
   2. Features: Include glass shelves and light in freezer compartment.
   3. Exterior Finish: Stainless steel.
   4. Manufacturers:
      a. Bosch; 800-Series B36CT80SNS: www.bosch-home.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Refrigerator: Under-counter single door type
   1. Capacity: Total minimum storage of 5 cubic ft
   2. Exterior Finish: Stainless steel
   3. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. KitchenAid: www.kitchenaid.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

D. Range: Natural gas, slide-in, with standard burners and removable drip pans.
   1. Size: 36 inches wide.
   2. Oven: Manual cleaning with electronic ignition.
   3. Elements: Six (6).
   4. Controls: Solid state electronic.
   5. Features: Include oven door window and oven light.
   6. Exterior Finish: Stainless steel, color as indicated.
   7. Manufacturers:
      a. Thermador; Pro Harmony Range Model PRG366WH: www.thermador.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Cooking Exhaust: Range hood
   1. Size: 36 inches wide.
   2. Fan: Variable-speed, 600 cfm
   3. Exhaust: Round, vented to exterior.
   4. Features: Include cooktop light, backdraft damper, removable grease filter, and exhaust duct cover.
   5. Exterior Finish: Stainless steel.
   6. Manufacturers:
      a. Vent-a-Hood; Premier Magic Lung series Model CWH-236: www.ventahood.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Microwave: Countertop.
   1. Capacity: 2.2 cubic ft.
   2. Power: 1200 watts.
   3. Features: Include turntable.
   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. KitchenAid: www.kitchenaid.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

G. Waste Disposer: Standard type, overload protection, direct wired, dishwasher connection, drain elbow, drain connector, and sound reduction features.
   1. Power: 1 HP.
   2. Capacity: Large.
   3. Height: 13 1/2 inch.
   4. Controls: Wall switch.
   5. Manufacturers:
      a. Inskinkerator; Evolution Excel: www.insinkerator.emerson.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

H. Dishwasher: Undercounter.
   1. Controls: Touch Control.
   2. Cycles: Six (6), including normal, short, and pot and pan.
   3. Finish: Stainless steel.

4. Manufacturers:
    a. Bosch; SHXM88Z75N: www.bosch-home.com.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ICE MAKER

A. Freestanding ice maker, floor mounted
    1. Storage Capacity: 75 lbs
    2. Production Capability: 260 lbs/day
    3. Features: Automatic shut off / overflow protection; self-cleaning mode
    4. Finish: Stainless steel
    5. Manufacturers:
        a. Maxx Ice; MIM200-series: www.maxx-ice.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

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 2400

WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Final Acceptance, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. MechoShade Systems LLC: www.mechoshade.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

A. General:
1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
a. Drop Position: Regular roll.
b. Roll Direction: Roll down, closed position is at window sill.
c. Mounting: Window jamb mounted - outside, on face of jambs.
d. Size: As indicated on drawings.
e. Fabric: As indicated under Shade Fabric article.
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
3. Roller Tubes: As required for type of shade operation.
a. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
b. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Hembars: Designed to maintain bottom of shade straight and flat.
5. Manual Operation for Interior Shades:
a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
6. Accessories:
a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
1) Color: To be selected by Architect from manufacturer's full selection.
2) Profile: Square.
b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.
c. Interior Side Channels: As required for light sealing room-darkening shade applications.
d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Performance Requirements:
a. Flammability: Pass NFPA 701 large and small tests.
2. Openness Factor: 3%.
3. Color: As selected by Architect from manufacturer’s full range of colors.

B. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Performance Requirements:
a. Flammability: Pass NFPA 701 large and small tests.
2. Openness Factor: zero (0). Block virtually all light.
3. Color: As selected by Architect from manufacturer’s full range of colors.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
   2. Horizontal Dimensions - Inside Mounting (Black-out shades): Fill openings from jamb to jamb.
   3. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch total.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Final Acceptance.

END OF SECTION

SECTION 12 3600

COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework.

B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

F. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

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

H. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

I. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

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

B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

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: See Section 06 4100.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1-1/8 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Dupont: www.corian.com/#sle.
         2) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      e. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; edge profile as indicated on drawings; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

C. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
   1. Flat Sheet Thickness: 1-1/8 inch, minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; 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) Corian; Quartz: www.corianquartz.com.
         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. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      d. NSF approved for food contact.
      e. Finish on Exposed Surfaces: Polished.
      f. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; edge profile as indicated on drawings; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, to match surface.

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 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, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

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, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch 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 Final Acceptance.

END OF SECTION

SECTION 13 4800

SEISMIC RESTRAINT FOR NON-STRUCTURAL COMPONENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic restraint to maintain the integrity of non-structural components of the building in the event of a seismic event.

1.02 RELATED SECTIONS

A. Section 03 4500 - Precast Architectural Concrete
B. Section 08 3613 - Sectional Doors.
C. Section 08 4313 – Storefront Systems.
D. Section 09 5100 - Acoustical Ceilings
E. Section 21 0000 - Fire Suppression Basic Requirements.
F. Division 22 - Plumbing
G. Division 23 - HVAC
H. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
I. Section 26 2413 - Service and Distribution.
J. Section 26 3213 - Engine Generators.
K. Section 26 5100 - Lighting.
L. Section 27 0000 - Communications Basic Requirements.
M. Section 28 3100 - Fire Detection and Alarm.

1.03 DEFINITIONS

A. Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
   1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; non-bearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; storage shelving, and pallet racks.
   2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; and telephone and communication systems.
   3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; medical gas systems; plumbing systems; sprinkler systems; pneumatic systems; boiler equipment and components.

1.04 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2011.
B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
C. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

H. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

J. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

K. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

L. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2015.

M. NUSIG - National Uniform Seismic Installation Guidelines.

N. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

O. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 QUALITY CONTROL

A. Shop Drawing Preparation:
   1. Seismic-force-restraint shop drawings and calculations shall be stamped and signed by a professional structural engineer experienced in seismic force restraints and licensed in Oregon.
      a. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in Oregon.

B. Coordination:
   1. Do not install seismic restraints until seismic restraint submittals are approved by the Structural Engineer of Record.
   2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

1.06 SUBMITTALS

A. Submit a coordinated set of architectural components, mechanical and electrical equipment anchorage drawings prior to installation, including:
   1. Mechanical, electrical and plumbing components in Risk Categories III and IV comply with current version of Oregon Structural Specialty Code 1705.11 and 1705.12 in accordance with ASCE/SEI 7-10.
      a. Provide special inspections for these installations.
      b. Provide a Certificate of Compliance Letter for each installation by the respective subcontractors complying with the Oregon Structural Specialty Code format. The letter is to be stamped by an structural engineer licensed in Oregon.
   2. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
   3. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.
   4. Numerical value of design seismic brace loads.
   5. For expansion bolts, include design load and capacity if different from those specified.
   6. Seal of registered structural engineer responsible for design.

B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, including:
   1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plan.

2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
3. Pipe contents.
4. Structural framing.
5. Location of all gravity load pipe supports and spacing requirements.
6. Numerical value of gravity load reactions.
7. Location of all seismic bracing.
8. Numerical value of applied seismic brace loads.
9. Type of connection (Vertical support, vertical support with seismic brace, etc.).
10. Seismic brace reaction type (tension only, tension and compression). Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.

C. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, including:
1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
3. Maximum spacing of hangers and bracing.

D. Submit prior to installation, bracing drawings for seismic restraint of metal storage shelving and pallet storage racks, including:
1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
3. Maximum spacing of hangers and bracing.

E. Submit design calculations stamped and sealed by the registered structural engineer.

F. Submit the appropriate ICC-ES evaluation reports for concrete anchors.

1.07 SEISMIC FORCES AND RESTRAINTS

A. Seismic force shall be based ASCE 7 and current local code.

$$F_p = \frac{0.4 a_p S_{DS} W_p}{\left(\frac{R_p}{I_p}\right)}$$

A. Where Fp = Seismic design force, ap = component amplification factor, SDS = Spectral acceleration, short period of 0.73 for this site and soil, Wp = component operating weight, Rp = component response modification factor, Ip = Importance factor of 1.5, and z/h = height in structure of point of attachment of component over average roof height of structure (conservatively set at 1.0).

B. Fp shall not be taken as less than Fp = 0.3SDS IpWp and is not required to be taken as greater than Fp = 1.6SDS IpWp

C. Exceptions: The attachments of the following items need not be considered.
1. Equipment weighing less than 400 pounds supported directly on the floor or roof.
2. Equipment weighing less than 20 pounds suspended from a roof or floor or hung from a wall.
3. Furniture; except storage racks, cabinets, and bookcases as specified in Part 3 of this Section.
4. Temporary or moveable equipment.
5. Gas piping less than one inch inside diameter.
6. Piping in boiler and mechanical equipment rooms less than 1-1/4 inch inside diameter.

7. All other piping less than 2-1/2 inch inside diameter except for automatic fire suppression systems.
8. All piping suspended by individual hangers, 12 inches or less in length from the top of the pipe to the bottom of the support for the hanger
9. All electrical conduits, less than 2-1/2 inch inside diameter.
10. All rectangular air handling ducts less than 6 square feet in cross sectional area.
11. All round air handling ducts less than 28 inches in diameter.
12. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.

PART 2 PRODUCTS

2.01 METALS

A. Fabricate members in accordance with AISC (MAN).

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

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 75 percent.

D. Structural Steel: ASTM A36/A36M.

E. Structural Tubing: ASTM A500/A500M, Grade B cold-formed steel tubing.

F. Structural Tubing: ASTM A501/A501M.

G. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise noted.

H. Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3; with hex nuts, ASTM A563, Grade C3; and, where indicated, flat washers.

2.02 CAST-IN-PLACE CONCRETE

A. Concrete: 28 day strength, f'c = 1,200 psi.

B. Reinforcing Steel: ASTM A615/A615M.

PART 3 EXECUTION

3.01 CONSTRUCTION, GENERAL

A. The design of all components as listed following this section shall comply with ASCE 7 and current local code.

B. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

C. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

D. Construct seismic restraints and anchorage to allow for thermal expansion.

E. Testing Before Final Inspection:
   1. Test 10 percent of anchors in concrete per ASTM E488/E488M to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10 percent testing frequency.
   2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

3.02 MECHANICAL AND ELECTRICAL EQUIPMENT

A. See drawings for equipment to be restrained or braced.

3.03 DUCTWORK AND PIPING; STACKS AND BREACHING; BUSWAYS, CONDUITS, AND CABLE TRAYS; AND WIRE AND CABLE TRAYS

A. Support and brace mechanical ductwork and piping; electrical busways, conduits and cable trays; and telecommunication wire and cable trays including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).

B. Brace duct and breeching branches with a minimum of one brace per branch.

C. Provide seismic restraints according to one of the following options:
   1. Meet requirements of the latest SMACNA (SRM) for the prescribed Seismic Hazard Level (SHL) A.
   2. Meet the most current requirements of the NUSIG.
   3. Where SMACNA or NUSIG requirements are not met completely, submit proposed alternate details and calculations to completely address seismic bracing requirements. For such designs, use the current Oregon Structural Specialty Code requirements.

D. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.
   1. Install sprinkler piping in accordance with NFPA 13 and local codes.

E. Seismic Restraint of Piping:
   1. Design criteria:
      a. Piping resiliently supported: Restrain to support 120 percent of the weight of the systems and components and contents.
      b. Piping not resiliently supported: Restrain to support 60 percent of the weight of the system components and contents.
      c. Except as noted above, meet requirements of International Building Code for determining seismic force Fp.
   2. Provide seismic restraints according to one of the following options:
      a. Meet the criteria listed above, and meet requirements of the latest SMACNA (SRM) for the prescribed Seismic Hazard Level (SHL) A.
      b. Meet the criteria listed above, and meet the most current requirements of the NUSIG.
      c. Where SMACNA or NUSIG requirements are not met completely, submit proposed alternate details and calculations to completely address seismic bracing requirements. Use the current local code requirements.

F. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.04 PARTITIONS

A. In buildings with flexible structural frames, anchor partitions to only one structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.

B. Properly anchor masonry walls to the structure for restraint, so as to carry lateral loads imposed due to earthquake along with their own weight and other lateral forces.

3.05 CEILINGS AND LIGHTING FIXTURES

A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures.

C. Ceilings shall be designed and installed in accordance with ASTM C635/C635M, ASTM C636/C636M, and ASCE 7.

3.06 FACADES AND GLAZED ALUMINUM CURTAIN WALLS

A. Do not install concrete masonry unit filler walls in a manner that can restrain the lateral deflection of the building frame. Provide a gap with adequately sized resilient filler to separate the structural frame from the non-structural filler wall.

B. Install attachments to structure for all facade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.07 STORAGE RACKS, CABINETS, AND BOOKCASES

A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.

B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.

C. Anchor filing cabinets that are more than two drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.

D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

END OF SECTION

21 0000

FIRE SUPPRESSION BASIC REQUIREMENTS

PART 1 GENERAL

1.01 DESIGN-BUILD SUMMARY OF WORK

A Work included in 21 0000 applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits and incidentals to make fire suppression systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

A This document is issued to give Bidders a basis for preparing a proposal to design and install a complete fire suppression system for this project.

B Alternates to this Document may be offered as a separate proposal.

1.03 DESIGN-BUILD DESIGN APPROACH

A Use this specification as a guide for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B Investigate and be apprised of applicable codes, rules, and regulations as enforced by AHJ.

C Visit the site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD DESIGN CRITERIA/CALCULATIONS

A Related Work Specified Elsewhere:

1 Contents of section apply to Division 21, Fire Suppression specifications.

2 Requirements of section are a minimum for Division 21, Fire Suppression sections, unless otherwise stated in each section, in which case that section's requirements take precedence.

1.05 SECTION INCLUDES

A Work included in 21 0000, Fire Suppression Basic Requirements applies to Division 21, fire suppression work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of fire protection systems for proposed project.

B Contract documents include, but are not limited to, specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, drawings, addenda, Owner/Architect agreement, and Owner/Contractor agreement. Confirm requirements before commencement of work.

C Definitions:

1 Provide: To furnish and install, complete and ready for intended use.

2 Furnish: Supply and deliver to project site, ready for unpacking, assembly, and installation.

3 Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete Item of work furnished.

4 Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability, or

longevity. For equipment/products defined by the contractor as "equivalent," substitution requests must be submitted to engineer for consideration, in accordance with Division 01, General Requirements, and approved by the engineer prior to submitting bids for substituted Item.

5 Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's authorized representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A Content of Section applies to Division 21, Fire Suppression Contract Documents.

B Related Work:

1 Additional conditions apply to this division including, but not limited to:

a Specifications including Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements.

b Drawings

c Addend

d Owner/Architect agreement

e Owner/Contractor agreement

f Codes, standards, public ordinances and permits

1.07 REFERENCES AND STANDARDS

A References and standards per Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements.

B Codes to include latest adopted editions, including current amendments, supplements, and local jurisdiction requirements in effect as of the date of the contract documents, of/from the State of Oregon.

C Reference standards and guidelines include but are not limited to the latest adopted editions from:

1 ABA - Architectural Barriers Act

2 ADA - Americans with Disabilities Act

3 AHRI - Air-Conditioning Heating & Refrigeration Institute

4 ANSI - American National Standards Institute

5 ASCE - American Society of Civil Engineers

6 ASCE-7 Minimum Design Loads for Buildings and Other Structures

7 ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers

8 ASHRAE Guideline 0, the Commissioning Process

9 ASME - American Society of Mechanical Engineer

10 ASPE - American Society of Plumbing Engineers

11 ASSE - American Society of Sanitary Engineering

12 ASTM - ASTM International

13 AWWA - American Water Works Association

14 CFR - Code of Federal Regulations

15 EPA - Environmental Protection Agency

16 ETL - Electrical Testing Laboratories

17 FCC - Federal Communications Commission

18 FM - FM Global

19 FM Global - FM Global Approval Guide

20 IAPMO - International Association of Plumbing and Mechanical Official

21 ICC - International Code Council

22 IEC - International Electrotechnical Commission

23 ICC-ESR - International Code Council Evaluation Service Reports

24 HI - Hydraulic Institute Standards

25 ISO - International Organization for Standardization

26 MSS - Manufacturers Standardization Society

27 NEC - National Electric Code

28 NEMA - National Electrical Manufacturers Association

29 NFPA - National Fire Protection Association:

a NFPA 13 - Standard for the Installation of Sprinkler Systems

b NFPA 24 - Standard for Installation of Private Fire Service Mains and Their Appurtenances

c NFPA 25 - Standard for Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

d NFPA 70 - National Electrical Code

e NFPA 72 - National Fire Alarm and Signaling Code

30 NRCA - National Roofing Contractors Association

31 NSF - National Sanitation Foundation

32 OSHA - Occupational Safety and Health Administration

33 SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.

34 TIMA - Thermal Insulation Manufacturers Association

35 UL - Underwriters Laboratories Inc.

1.08 SUBMITTALS

A See Division 01, General Requirements for submittal.

B Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the contract documents.

C "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the contract documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the contract

documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work

D Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each specification section. Arrange bookmarks in ascending order of specification section number. Individual submittals sent piecemeal in a per specification section method will be returned without review or comment. Copy architect on all transmissions/submissions.

E Submit shop drawings, calculations, and product data sheets as one complete stand-alone package to AHJ, Owner's insurance underwriter and engineer.

F Product Data: Provide manufacturer's descriptive literature for products specified in Division 21.

G Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, contractor remains responsible for providing equipment and materials that meet the specifications and drawings.

1 Label submittal to match numbering/references as shown in contract documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed Item. Highlight connections by/to other trades.

2 Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished, or provided. Reference Division 21, Fire Suppression specification sections for specific Item required in product data submittal outside of these requirements.

3 Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.

4 For vibration isolation of equipment, list, make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.

H Maximum of two reviews provided of complete submittal package. Arrange for additional reviews and/or early review of long-lead item, bear costs of additional reviews at engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

I Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of engineer’s comments. Identify engineer’s comments and provide an individual response to each of the engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to engineer’s comments.

J Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment importance factor as specified in Division 01, General Requirements and in structural documents.

K Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 21, Fire Suppression coordination documents. For equipment with electrical connections, furnish copy of approved

submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety and Security submittals.

L Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

M Substitutions and Variation from Basis of Design

1 The basis of design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this specification or included in an approved substitution request as judged by the design professional.

2 If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the base bid, including resulting charges for work performed under other divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to engineer for approval prior to purchase, delivery, or installation.

N Shop Drawings:

1 Provide coordinated shop drawings which include physical characteristics of all systems, equipment and piping layout, pipe layout, hanger layout, sway brace layout, seismic restraints, sway brace calculations, drains, location of drain discharge, risers, valves, details, water test information, physical device layout plans, and control wiring diagrams.

2 Shop drawings and hydraulics calculations, sway brace calculations, trapeze hanger calculations, and the like, to be prepared under the direct supervision and control of a professional engineer competent to do such work and licensed in the State of Oregon. Drawings and calculations to bear the seal and wet signature of the professional engineer.

3 Provide shop drawings which indicate information required by NFPA 13. Include room names and fire sprinkler occupancy hazard classifications.

4 Provide shop drawings illustrating information for hydraulic information sign for each hydraulic remote area calculated.

5 Utilizing the reflected ceiling backgrounds, provide shop drawings illustrating locations of fire sprinklers and piping.

6 Utilizing the structural backgrounds, provide shop drawings illustrating locations and types of hangers and sway braces.

7 Provide shop drawings illustrating each type of hanger, including fasteners to structure.

8 Provide shop drawings illustrating each type of branch-line restraint and sway brace, including length of sway brace member, sway brace fittings, minimum and maximum angles from vertical of sway brace member, method of attachment to structure, size, length, and embedment of attachment to structure and size and type of structural member to which sway brace will be attached. Number each type of restraint and sway brace. Indicate on drawings locations of each type of numbered restraint and sway brace.

9 Provide details for any hanger, attachment, or sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the engineered product manufacturer.

10 Provide shop drawings illustrating information for sprinkler system general information sign.

11 Shop drawings to include a cross-sectional view that shows the sprinkler heads and piping in relation to the building's architectural and structural information. View to be chosen based on a location that will display the most information.

12 When required, provide coordination drawings.

13 Provide shop drawings indicating access panel locations, size, and elevation for approval prior to installation.

14 Provide details of hanger, sway bracing and branch line restraint attachments to structure and to piping. Include details on the size and load capacities of fasteners. Provide verification of the structural capacity to withstand seismic load.

15 Provide sway bracing calculations on drawings showing horizontal seismic design load and requirements, with indication of zone of influence for each bracing location.

16 Provide a schedule of sway bracing type, size, and design criteria, including length, angle from vertical, and load capacities.

17 Provide details of dry sprinkler barrel length per manufacturer's recommendations based upon the expected cold temperature and ambient temperature of the wet pipe system sufficient to prevent freezing or ice build-up in the wet pipe system.

18 Clearly indicate the elevation of the highest sprinkler in relation to the elevation of the flow test pressure gauge monitor hydrant.

19 Provide details of flexible sprinkler hose fitting per manufacturer's schedule of equivalent feet used in hydraulic calculations, showing device length, maximum number of 90-degree bends and expected radius of bends.

20 Provide a schedule of signage to be installed at each flexible sprinkler hose fitting.

21 On the drawings, provide a list of number, model, temperature, sprinkler Identification number, manufacturer, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the spare sprinkler cabinet and the issue date or revision date of the list."

22 Spare sprinkler head cabinet size indicating the number of spare sprinkler head to be contained therein.

O Resubmission Requirements:

1 Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Clearly indicate changes on drawings and cloud changes in the submittals.

2 Resubmit for review until review indicates no exceptions taken or make "corrections as noted".

P Operation and Maintenance Manuals/Owner's Instructions:

1 Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or Item requiring servicing.

Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

a Include copies of certificates of code authority acceptance, code-required acceptance tests, test reports and certificates.

b Include warranty per Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements.

c Catalog description of each Item of equipment installed on job.

d Instructions for operation and maintenance of fire suppression systems composed of operating instructions, maintenance instructions and manufacturer's literature as follows:

1) Testing and Maintenance Schedule Chart: Provide an 8-1/2- by 11-inch typewritten list of each item of installed equipment requiring testing inspection, lubrication or service, describing and scheduling performance of maintenance.

2) Manufacturer's Literature: Provide copies of manufacturer's instructions for operation and maintenance of fire suppression equipment, including replacement parts list with name and address of nearest distributor. Mark each copy with equipment identification label as listed in equipment schedule, i.e., F-5 etc.

e Include product certificates of warranties and guarantees.

f Include record drawings,

g Include copy of water supply flow test used as basis for hydraulic calculations.

h Include hydraulic calculations and sway brace calculations.

i Include contractor’s material and test certificates for aboveground piping/underground piping.

j Include a copy of NFPA 25.

k Include a copy of valve charts and whether normally open or normally closed.

l Include a copy of drain, auxiliary, and low point drains charts.

m Include a copy of the list to be included in the spare sprinkler head box.

n Include copy of approved submittal data along with submittal review letters received from engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

o Include copy of manufacturer's standard operations and maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, and quantities relevant to each piece of equipment i.e., belts, motors, lubricants, and filters.

p Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

q Include copy of startup and test reports specific to each piece of equipment.

r Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in submittal review format. Contractor must arrange for

additional reviews; contractor to bear costs for additional reviews at engineer's hourly rates.

2 Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 21 0000, Fire Suppression Basic Requirements, article titled "Demonstration".

3 Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on drawings.

Q Record Drawings:

1 Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical item. Include items changed by field orders, supplemental instructions, and constructed conditions.

2 Record drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

3 At completion of project, input changes to original project on CAD drawings and make one set of black-line drawings created from CAD files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.

4 Invert elevations and dimensioned locations for water services and drainage piping below grade extending to 5-feet outside building line.

5 Record drawings to include site information or reference site information for complete understanding of the fire protection system between the building and the point of connection to the water supply and location of flow test pressure hydrants.

R Calculations: Submit hydraulic and sway brace and the like calculations.

1 Hydraulic Calculations:

a Include friction losses between the hydraulically most remote design area and the hydrant flow test pressure hydrant.

b Hydraulic calculations to be performed on a nationally recognized fire sprinkler hydraulic calculation computer program, with cover sheets in the format required by the latest edition of NFPA 13. Hydraulic calculations performed “by hand” or not on a nationally recognized fire sprinkler hydraulic calculations computer program will be returned without review by engineer.

c Provide one or more hydraulic calculations for each hydraulically most remote area.

d Where it is not obvious which area is most hydraulically remote, perform and submit for review additional hydraulic calculations proving the hydraulically most remote area.

e For grid systems, either provide “peaked” hydraulic calculations, or provide two additional sets of hydraulic calculations for each hydraulically most remote area.

f Include pressure losses between the highest sprinkler and the elevation of the pressure gauge monitor hydrant of the flow test.

g Include friction loss for flexible branch line connectors per manufacturer's schedule of equivalent feet for device length, maximum number of bends and expected radius of bends.

h When flexible sprinkler hose fittings are added to an existing system, provide hydraulic calculations verifying the design flow rate will be achieved."

i For Future Tenant Improvement Spaces: Include in hydraulic calculations friction loss allowances for future installation of flexible sprinkler head connectors so that flexible connectors may be installed in the future without revisions to the overhead system.

2 Sway Brace Calculations:

a Sway brace calculations utilizing a proprietary computer calculation program only used for the sway brace components supported by that manufacturer. For example, only “manufacturer X” sway brace components, and not those of another manufacturer, may be calculated on a "manufacturer X” sway brace computer calculation program.

b Provide seismic calculations for any sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the manufacturer.

1.09 QUALITY ASSURANCE

A Regulatory Requirements: Work and materials installed to conform with all local, state, and federal codes, and other applicable laws and regulations. Where code requirements are at variance with contract documents, meet code requirements as a minimum requirement and include costs necessary to meet these in contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B Whenever this specification calls for material, workmanship, arrangement, or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C Drawings are intended to be diagrammatic and reflect the basis of design manufacturer's equipment. They are not intended to show every Item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than basis of design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with contract documents, obtain clarification. Notify engineer/architect, in writing, before starting work.

E Items shown on drawings are not necessarily included in specifications or vice versa. Confirm requirements in all contract documents.

F Provide products that are UL listed.

G Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.10 WARRANTY

A Provide written warranty covering the work for a period of one year from date of substantial completion in accordance with Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements.

B Sections under this division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements, and the general conditions. Confirm requirements in all contract documents.

1.11 COORDINATION DOCUMENTS

A Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, fire alarm, plumbing, cable trays, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, electrical, fire alarm ceiling suspension and tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e., roofing, ceiling, and finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence. Unless otherwise required by Division 00, Procurement and Contracting Requirements and/or Division 01, General Requirements, Division 23, Heating, Ventilating, and Air-Conditioning (HVAC) to combine information furnished by other trades onto master coordination documents.

B Prepare Drawings as follows:

1 Provide drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as contract drawings and indicate location, size, and elevation above finished floor of equipment and distribution systems.

2 Review and revise, as necessary, section cuts in contract drawings after verification of field conditions.

3 Indicate fire protection system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.

4 Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible Item. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings, architectural reflected ceiling drawings and HVAC equipment, ductwork, and piping. Drawings to indicate proposed and identified structural members to which hangers and sway braces will be attached as shown on structural drawings.

5 Incorporate addenda item and change orders.

6 Provide additional coordination as requested by other trades.

C Advise architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise architect of conflict.

D Verify in field exact size, location, invert, and clearances regarding existing material, equipment, and apparatus, and advise architect of discrepancies between that indicated on drawings and that existing in field prior to installation related thereto.

E Submit final coordination drawings with changes as record drawings at completion of project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to sprinkler heads, pipe, fittings, hangers, and bracing materials.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL, ETL, FM, and ICC-ES approved for their intended fire protection function or have adequate approval or be acceptable by State, County, and City authorities.

B Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C Hazardous Materials:

1 Comply with local, State of Oregon, and federal regulations relating to hazardous materials.

2 Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3 Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements.

B Install equipment requiring access (i.e., drains, control operators, valves, motors, engines, pumps, controllers, air compressors, gauges, fill cups, tanks, cleanouts, and the like) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles, or crawlspaces which would impede, or block intended usage.

C Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with contract documents, request clarification from architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D Earthwork:

1 Confirm Earthwork requirements in contract documents. In absence of specific requirements, comply with the following:

a Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this division in accordance with the provisions specified. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.

b Excavation: Do not excavate under footings, foundation bases, or retaining walls.

c Provide protection of underground systems. Review the project geotechnical report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E Firestopping:

1 Confirm firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with the following:

a Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork, and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM

International E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F Pipe Installation:

1 Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors, or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with project structural engineer. Verify construction phasing, type of building construction products and rating coordinating installation of piping systems.

2 Include provisions for servicing and removal of equipment without dismantling piping.

G Plenums: Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify architect/engineer of discrepancy.

3.02 SEISMIC CONTROL

A Confirm seismic control requirements in Division 01, General Requirements, structural documents.

B Provide fire suppression equipment and piping, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to lateral seismic forces as determined by building code and NFPA 13 calculations, whichever is more demanding.

C See structural drawings for seismic design criteria for sway bracing and seismic restraint.

D Earthquake resistant designs for Fire Protection (Division 21, Fire Suppression) equipment and distribution, i.e., fire sprinkler systems, fire standpipe systems, fire pumps, fire pump controllers, fire tanks, clean agent fire suppression systems, etc. to conform to regulations of jurisdiction having authority.

E Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

F Provide stamped shop drawings from licensed engineer of seismic bracing and seismic movement assemblies for piping, equipment, tanks, pumps controllers and the like. Submit shop drawings along with equipment submittals.

G Provide stamped shop drawings from licensed engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details.

H Provide details of flexible drops for sprinklers in conformance with building code and ASCE 7 requirements of ceilings. Coordinate with architectural and structural drawings and specifications.

I Piping: Per NFPA 13, ASCE-7 and local requirements.

J Equipment:

1 Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA, ASCE 7 and local requirements.

2 Provide means to prohibit excessive motion of fire protection equipment during an earthquake.

3.03 REVIEW AND OBSERVATION

A Confirm review and observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

B Notify architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1 Underground piping installation prior to backfilling.

2 Prior to covering walls.

3 Prior to ceiling cover/installation.

4 When main systems, or portions of, are being tested and ready for inspection by AHJ.

5 When mains or branchlines are to be permanently concealed by construction or insulation systems.

6 When fire suppression systems, or portions of, are being tested and ready for inspection by AHJ.

C Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify architect at times prescribed above, costs incurred by removal of such work are the responsibility of the contractor.

D Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the contractor.

3.04 CUTTING AND PATCHING

A Confirm cutting and patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with the following:

1 Cutting and patching performed under Division 21, Fire Suppression includes, but is not limited to:

a Cutting and patching of plaster or partitions.

b Cutting and patching of finished ceilings.

2 Perform cutting and patching by skilled craftsmen in trade of work to be performed. Fill holes which are cut oversized for completed work. Match refinished areas with existing adjacent finish in a manner acceptable to architect.

3 When masonry to concrete construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Provide escutcheons. If sleeves are not provided, core drill penetrations.

4 Locate concealed utilities to eliminate possible service interruption or damage.

5 Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

6 Proposed floor cutting/core drilling/sleeve locations to be approved by project structural engineer. Submit proposed locations to architect/project structural engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to project structural engineer/architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

7 Cutting, patching, and repairing for work specified in this division including plastering, masonry work, concrete work, carpentry work, and painting included under this section will be performed by skilled craftsmen of each respective trade in conformance with appropriate division of work.

8 Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.

9 Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, landscaping, paving, and walks, surfaces to be repaired, refinished, and left in condition matching existing prior to commencement of work.

10 Repair mutilation of building around pipes, equipment, hangers, and braces.

3.05 EQUIPMENT SELECTION AND SERVICEABILITY

A Replace or reposition equipment which is too large or located incorrectly to permit servicing at no additional cost to Owner.

3.06 DELIVERY, STORAGE AND HANDLING

A Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with the following:

1 Handle materials delivered to project site with care to avoid damage and deterioration. Store materials in original containers which identify manufacturer, name, brand, and model numbers on site inside building or protected from weather, sun, dirt, and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust because of improper storage to be replaced before installation.

2 Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3 Protect bright finished shafts, bearing housings and similar Item until in service.

3.07 DEMONSTRATION

A Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

B Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, architect and engineer that equipment furnished and installed or connected under provisions of these specifications functions in manner required. Provide field instruction to Owner's maintenance staff as specified in Division 01, General Requirements.

C Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

D Prior to acceptance of work and during time designated by architect, provide necessary qualified personnel to operate system for a period of two hours.

E Instruct the Owner in the operation of the sprinkler system, including main valve position (open or closed) recognition, system drainage, system testing and the relation to the fire alarm system.

F Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Authorized Representative and architect that equipment is furnished and installed or connected under provisions of these specifications.

3.08 CLEANING

A Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

B Upon completion of installation, except for sprinklers, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

C Sprinklers may not be cleaned except for vacuuming in a way no part of the sprinkler is touched by the vacuuming equipment. Replace sprinklers which bear traces of foreign substances with sprinklers of same model, temperature, K-factor, orifice, finish, style, orientation, and the like.

3.09 INSTALLATION

A Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

B Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C Start-up equipment, in accordance with manufacturer's start-up instructions, in the presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide pump impellers to obtain basis of design capacities.

D Provide miscellaneous supports/metals required for installation of equipment and piping.

3.10 PAINTING

A Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with the following:

1 Ferrous Metal: After completion of fire protection work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.

2 After acceptance by Authority Having Jurisdiction (AHJ), in a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by architect.

3 Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding, or patching to match original.

4 Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

5 Covers: Covers such as vault covers, and the like will be furnished with finishes which resist corrosion and rust.

3.11 ACCEPTANCE

A Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual sections in Division 21, Fire Suppression, and the following:

1 System cannot be considered for acceptance until work is completed and demonstrated to architect that installation is in strict compliance with specifications, drawings, and manufacturer's installation instructions, particularly about following:

a Testing reports including contractor's material and test certificate for underground piping, contractor's material and test certificate for aboveground piping, contractor's material and test certificate for private fire service mains, fire pump acceptance test data report, and the like.

b Cleaning

c Operation and maintenance manuals

d Training of operating personnel

e Record drawings

f Warranty and guaranty certificates

g Start-up/test document and commissioning reports

h Letter of conformance

3.12 FIELD QUALITY CONTROL

A Confirm field quality control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

B Upon completion of installation of equipment, sprinklers, hose valves and piping and after units are water pressurized, test system to demonstrate capability and compliance with requirements. When possible, correct malfunctioning Item at site, then retest to demonstrate compliance; otherwise remove and replace with new Item and proceed with retesting.

C Inspect each installed Item for damage to finish. If feasible, restore and match finish to original, except fire sprinklers, at site; otherwise, remove Item and replace with new item. Feasibility and match to be judged by architect. Remove cracked or dented Item and replace with new item.

D Fire sprinklers may not be reused, or cleaned, except for dusting. Replace damaged, field painted, over-sprayed, overcoated or field coated sprinklers with new sprinklers of same manufacturer, model, finish, K-factor, and performance characteristics. Where identical replacement sprinklers are not available, provide sprinklers of similar finish, style, K-factor, and performance characteristics.

3.13 LETTER OF CONFORMANCE

A Provide letter of conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include letter of conformance, copies of manufacturers' warranties and extended warranties in operation and maintenance manuals.

3.14 ELECTRICAL INTERLOCKS

A Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize fire protection equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.15 CONNECTIONS TO EXISTING

A Prior to connection of piping to existing piping or utilities, field verify existing conditions and exact sizes and locations of existing piping. Provide additional offsets, transitions, joints, cut ins, and replace portions of existing as required to facilitate connections of new.

END OF SECTION

22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 DESCRIPTION

A This section addresses general issues regarding materials and methods, site examination, drawings, handling, storage, and installation.

1.02 REFERENCE

A The work under this section is subject to requirements of the contract documents including the general conditions, supplementary conditions, and general requirements.

1.03 REQUIREMENTS

A The contractor shall obtain and pay for all permits and fees necessary to complete the work included in the section. All work shall conform to all applicable local, county, state, & federal codes & regulations and Owners standards.

B Drawings and Layout

1 Drawings are diagrammatic. The layout of the piping, ducts and equipment shown on the drawings is generally diagrammatic unless specifically dimensioned. Drawings are not intended to be precise, and do not specify or show every offset, fitting, and component. The purpose of the drawings is to indicate a system concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the geometrical relationships, the contractor shall provide all other components and materials necessary to make the system fully complete and operational.

2 All dimensions for the location of walls, partitions, doors, etc. shall be taken from the architectural drawings.

3 All shown sizes for existing ductwork and dampers are approximate. Contractor shall field verify all existing dimensions prior to fabrication of transitions and new ductwork and ordering dampers contractor shall route piping or provide offsets to avoid interference with structural elements, electrical panels, and junction boxes etc. Verify locations, dimensions, existing flow directions, etc. before construction. Field verify all sizes, dimensions, and equipment locations prior to construction.

4 The contractor is responsible for providing all components necessary for a fully functioning system, including details of design not shown in the project drawings. Additional details including routing, supports, restraints and controls are the responsibility of the contractor.

C Deliver all guarantees and warranties on this portion of the work to the Owner’s Authorized Representative. All equipment, materials and workmanship shall be guaranteed to be free from defects for a period of at least one year following substantial completion. Replace all parts proving defective during that time, including the replacement of lost refrigerant and repair of leaks, to the approval of the Owner’s Authorized Representative and at no additional cost to the Owner. Submit warranties per Division 01, General Requirements of the specifications.

D Coordination

1 Coordinate the work under this section with that of all other trades; check all contract drawings and specifications for possible conflicts between the several trades in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, supply and exhaust

diffusers, fire sprinklers, structural and architectural features. Should it be found necessary to deviate from the plans or specifications for any reason whatsoever, the Owner's Authorized Representative written approval will be required.

2 Note that the spaces reserved for ducts, piping and lights above the furred ceilings are in some cases quite critical. Location of light fixtures shall not be changed. Any work installed without regard for the work of other crafts which must, in the opinion of the architect, be moved to permit the installation of other work, shall be moved without extra charge.

3 Spaces are provided in the design of the building, in most cases, to conceal the heating and ventilating work. Keep all pipes and ducts within the furring lines established on the architectural drawings unless the pipes and ducts are shown exposed.

E Site Examination

1 Examine the site, verify dimensions and locations against the drawings, and be informed of all conditions under which work is to be done before submitting proposal.

2 Information shown relative to existing services is based upon available records and data during preparation of drawings but shall be regarded as approximate only. Make deviations as required to conform to actual locations and conditions without extra cost.

3 Change orders resulting from the contractor's failure to verify existing conditions shall not be considered.

F Materials and Substitutions:

1 Detailed submittals shall be submitted for engineer and Owner's Authorized Representative approval prior to procurement of all equipment and materials.

2 All materials incorporated into this project, unless specifically stated otherwise, shall be new and without defect. All materials shall be as specified unless approved by the Owner's Authorized Representative via a submittal

3 Numbers on the drawings and in the specifications are taken from the catalogs of the manufacturers named.

4 When specific names are used in connection with material hereinafter mentioned, they are mentioned as standards, but this implies no right to use other materials or methods unless approved as equal in quality and utility by the consulting engineer or the Owner's Authorized Representative. The decision of the engineer shall govern as to what material is equal to that named, but the burden of proof as to the quality of any proposed material shall be the contractor's responsibility.

5 All materials shall be installed in a neat and workmanlike manner. Any work installed which is in the opinion of the engineer and Owner, not indicative of good workmanship shall be removed and replaced in a manner satisfactory to the engineer and Owner. All expenses incidental thereto shall be borne by the installing contractor.

6 Where more than one specific name is used, it is to be understood that the name mentioned first represents the manufacturer whose equipment has been used as the basis of design. Any revisions, additions or deletions involving the work of other trades because of substituting other manufacturer's equipment shall be the contractor's responsibility. All such changes shall be made at no additional cost to the Owner.

7 Where specifications and drawings require higher standards than applicable ordinances or statutes, specifications and drawings shall take priority. Where specifications and drawings violate applicable ordinances or statutes, the latter shall take priority.

G Work shall not be covered or enclosed until it has been inspected, tested, and approved by the engineer, Owner and authorities having jurisdiction over the work.

H Safety shall be a prime concern of the contractor and his subcontractors. The contractor shall take all due precautions during the execution of this project to protect the Owner's employees and property and to protect the contractor's employees and subcontractors.

I All work shall be performed in accordance with Owner's lockout-tagout procedures.

J Use all means necessary to protect plumbing, fire sprinkler, heating, ventilating and air conditioning material and equipment before, during, and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the architect and at no additional cost to the Owner.

K Record Drawings:

1 In addition to other requirements, mark up a clean set of drawings as the work progresses, to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing and location of items cast in concrete or buried underground. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown. Indicate location of all items added by addendum or change order.

2 Maintain "Record Document" drawings in an up-to-date fashion in conjunction with the actual progress of installation. This set of field drawings shall be kept up daily. Accurate progress mark-ups shall always be available on-site for examination by the Owner's Authorized Representative, architect, or mechanical engineer.

1.04 QUALITY ASSURANCE

A All work shall be performed in a neat and professional manner using high quality craftsmanship.

B Order piping with each length marked with manufacturer's name or trademark and type of pipe; with each shipping unit marked with purchase order number, metal or alloy designation, temper, size, and supplier's name.

C Installed material not meeting specification requirements must be replaced with material that meets these specifications without additional cost to Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A Promptly inspect shipments to ensure material is undamaged and complies with specifications.

B Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends from damage. End caps shall remain in place. Protect fittings by storage inside or by durable, waterproof, above ground packaging.

C Offsite storage agreements will not relieve contractor from using proper storage techniques.

D Storage and protection methods must allow inspection to verify products.

1.06 SUBMITTALS

A Manufacturer's technical data for the following:

1 Pipe and fittings

2 Joints

3 Cleanouts

4 Floor drains

5 Traps

6 Oil/water separator.

7 Flexible ball joints

8 Precast trench drains and catch basins

9 Plumbing fixtures

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CUTTING, DRILLING AND PATCHING

A All necessary cutting and patching of walls, floors, partitions, ceilings, etc. as required for the proper installation of work under this section shall be done under this section and Division 01, General Requirements.

B No cutting of structural members will be permitted without the written permission of the engineer.

C Where work is performed above existing ceilings, the contractor shall carefully remove ceiling tiles and grid as needed to perform the work. The contractor is responsible for reinstalling the ceiling and replacing any damaged grid and tile.

D Before performing any cutting, drilling or other dust producing work a dust barrier must be erected to protect Owner’s equipment. This barrier must be approved prior to work commencing and remain intact throughout the dust producing work. Provide an 8 feet x 4 feet x ¼ inch sheet of plywood draped with new cloth painter's tarp, when working above equipment. The Owner, or Owner’s Authorized Representative must approve dust barrier prior to starting any work.

E When drilling or cutting overhead, regardless if performed over any communications equipment, the work shall be performed as a two-person operation. One worker shall operate the cutting/drilling equipment and the second worker shall operate a heavy-duty construction vacuum cleaner to remove the debris as produced. The vacuum must be in operation prior to the cutting/drilling and it shall continue until after the cutting/drilling and cleanup of all loose particles is complete. Hold the vacuum hose as close to the cutting/drilling operation as is safe to limit the spread of the dust particles.

F Patch building surfaces where equipment and/or supports were removed. Refinish surfaces to match existing.

G Repair and patch all (new and existing) wall and floor penetrations to match existing finish. Provide sleeves and seal all penetrations of fire rated walls/floors in accordance with UL Specifications, with 3M and/or Hilti fire stopping materials approved for the purpose. Provide fire dampers where ducts penetrate fire rated walls or floors.

H Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the Owner or other trades.

3.02 INSTALLATION

A Equipment Installation:

1 Install all equipment in strict accordance with the manufacturer’s instructions unless otherwise indicated.

2 Where the installation shown or specified is contrary to the manufacturer’s instructions, advise the architect in writing of the differences before proceeding with the installation.

3 The drawings in general are based upon one of the specific manufacturers listed for a particular equipment item. The other specified manufacturers and additional approved manufacturers of equipment may require deviations from the drawings to properly install the equipment in accordance with the manufacturer's recommendations and to provide the system results required. Provide the work necessary to install this equipment.

4 Unless specifically noted on the drawing, mechanical equipment and/or ductwork shall be supported or hung from building members only. Do not utilize server or telecommunications equipment racking for mechanical equipment and/or ductwork support.

5 All wall penetrations shall be cut with a power saw or drill. Hand chisel work is not acceptable. Cuts shall be well defined to fit the application. Do not over cut the hole. All cuts shall present a neat and tailored appearance. Sleeves shall be provided for all piping and ductwork extended through walls and floors to protect the piping.

6 In addition to fire-safing and weather sealing requirements, provide chrome escutcheon rings where ducts and pipes penetrate the finished side of walls and ceilings.

7 Provide supports for all apparatus as specified, detailed, and as required by the manufacturers of specific equipment. Anchor all roof equipment with size and spacing of anchor bolts as recommended by the respective equipment manufacturer. Provide seismic earthquake restraints on all equipment, piping, ductwork, and other materials as required by code, in accordance with zone 3 seismic requirements.

8 At the time of start-up, the contractor shall verify phasing and/or proper rotation of all moving parts. The contractor shall also verify input and output voltages of all transformers. All findings shall be recorded and provided to the Owner's Authorized Representative.

9 Maintain a copy of the manufacturer's installation instructions at the jobsite for all equipment.

B Firestopping at Fire-Rated Wall/Floor Assemblies:

1 Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814.

2 At the end of each day the contractor shall fill all open holes with fireproof materials to act as a fire stop.

3 At the end of the project the contractor shall have completely fire stopped the wall, floor, and ceiling penetrations using 3M, Hilti or Nelson firestopping. Concrete/brick/block wall penetrations shall be firestopped the same as except the metal sheeting shall be anchored appropriately to the concrete/brick/block.

C Cleaning:

1 Maintain premises and public properties free from accumulations of waste, debris, dust, and rubbish during construction.

2 Clean all mechanical equipment of dust, grease, iron cuttings, unnecessary stamps, or shipping labels, etc.

3 Touch-up factory-painted surfaces, as necessary, with paint of matching color.

END OF SECTION

22 0529

HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 REFERENCE

A The work under this section is subject to requirements of the contract documents including the general conditions, supplementary conditions, and general requirements.

1.02 DESCRIPTION

A Provide all supporting devices as specified and as required for proper support of HVAC piping, equipment, materials, and systems. Hangers and supports to be furnished and installed under this section of the specifications shall include those required for all ductwork and plenum systems handling supply air, return air, outside air or exhaust air systems.

B Support for all conditions of operation, including variations in installed and operating weight of equipment and piping, to prevent excess stress and allow for proper expansion and contraction.

1.03 DESIGN CRITERIA

A Materials and application of pipe hangers and supports shall conform to latest requirements of ANSI/ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58 (Materials, Design and Manufacture), SP-69 (Selection and Application), and SP-89 (Fabrication and Installation Practices), except as supplemented or modified herein.

B Support materials shall be steel or stainless steel unless specifically indicated.

C Unless otherwise indicated, design structural support members and support devices including couplings, rods, trapeze supports and strut systems with safety factor in accordance with AISC Manual of Steel Construction, but not less than 2.0.

D Maximum deflection determined by the following equation shall be used.

$$D = \frac{H \text{ or } L}{250}$$

Where:

D = Maximum deflection in Inches

H = Member height in Inches

L = Member length in Inches

E Unless otherwise indicated, hangers, support devices and hardware shall be steel and finish shall be hot-dipped galvanized finish for outdoor application, and either factory standard paint, hot-dipped or electro-plated finish for indoor application. Coat cut edges, welds or any finish damaged with galvanized paint.

F Material in contact with pipe shall be compatible with piping material so that neither shall have deteriorating action on the other. If materials are not compatible, provide nonmetallic separation between uninsulated copper or stainless-steel piping and metal supports. Plastic coated steel supports are acceptable.

G Unless otherwise indicated, steel support devices exposed to ventilation air stream shall be stainless steel, or steel with either galvanized finish or paint finish. Paint type shall be approved by engineer.

H Contractor is responsible for proper placement and sizing of supporting devices to accommodate insulation thickness and pitching of pipe.

I In addition to hangers specified in this section, piping connected to pumps, compressors, and similar rotating or reciprocating equipment shall have vibration isolation hangers or supports for distance of 100 pipe diameters or 3 hangers away from equipment, whichever is greater.

J Piping connected to coils, which are in assembly mounted on vibration isolators shall have flexible piping connections and vibration supports as indicated above. Piping connected to coils, which are in equipment where fan assembly is separately isolated by means of vibration isolators and duct flexible connections does not require additional spring vibration supports.

K Where piping can be conveniently grouped to allow trapeze type supports, supporting steel shall be by means of standard structural shapes.

L Hangers and rods shall be plumb when pipelines are at their normal operating temperatures.

M Design of structural steel supports shall be reviewed and approved by engineer.

N Unless otherwise indicated, continuous insert channels are not allowed.

O Punching, drilling, or welding of building structural steel is not allowed unless approved by Structural engineer.

P Any proposed weld attachments to building structure need reviewing by structural engineer prior to execution of work. This review may result in use of other welding codes or standards, which may apply to "structural work". Execution of this work may be assigned to general trades responsible for building structural steel. Cost for this work, however, will remain the responsibility of this contractor.

Q Where fire rated fiberglass products are used for channel and support devices, the following properties shall apply:

1 Flame Spread Properties

a Polyester Fiberglass (PF) Class 1 ASTM E-84

b Vinylester Fiberglass (VF) Class 1 ASTM E-84

R Fasteners including concrete anchors for seismic application shall meet ICBO evaluation report and requirements of local authorities.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS (METALLIC)

A Manufacturers: Grinnell, Michigan Hanger, Tolco, or B-Line, equal to Grinnell figures listed.

B Hangers/supports for copper pipe without insulation shall be either copper plated or PVC coated.

C For insulated pipe supports, refer to insulated pipe supports in Part 2 and Part 3 of this section.

D Clevis and Roller Type Hangers:

System	Pipe Size	Clevis	Roller
Hot Pipes with Insulation	2 inches &	65, 260	---

System	Pipe Size	Clevis	Roller
(120 degrees F & above)	smaller		
	2-1/2 inches to 6 inches	---	171, 181
Ambient Bare Pipes (60 degrees F to 119 degrees F)	2 inches & smaller	65, 260	---
	2-1/2 inches and over	260, 216	---
Cold Pipes with Insulation (33 degrees F to 59 degrees F)	2 inches & smaller	65, 260	---
	2-1/2 inches and over	260, 295	---

1 Where there is horizontal movement at support points due to thermal expansion/contraction, clevis type hangers like Grinnell Figure 260 may be used if vertical angle of hanger rod is less than 4 degrees.

E Flat Surfaces (Trapeze, Rack Type):

1 Use structural steel members such as struts, angles, channels, beams to support pipes as required. Select members properly for pipe support types and loading conditions. Refer to Part 1 for design criteria. Submit support detail(s) with type of members selected and load calculations. Provide straps, clamps, rollers, or slides indicated below at each support point.

System	Pipe Size	Straps or Clamps	Rollers	Slides
Hot Pipes with Insulation (120 degrees F & above)	2 inches & smaller	243,244	---	---
	2-1/2 inches and over	---	177,271,274	436 with 212 or 432 clamps, Type 1, Type 2 or Type 3 base
Ambient Bare Pipes (60 degrees F to 119 degrees F)	All sizes	137	---	---
Cold Pipes with Insulation (33 degrees F to 59 degrees F)	10 inches and smaller	137	---	---

2.02 INSULATION PROTECTION SHIELDS

A Grinnell Figure 167 constructed of galvanized carbon steel. Select shield to accommodate outer diameter of insulation. Shield length and gauge shall be as follows.

Pipe Size	Length	Gauge
¼ inch thru 3 inches	12 inches	18
4 inches thru 6 inches	18 inches	16
8 inches thru 12 inches	24 inches	14

2.03 INSULATION PROTECTION SADDLES

A Grinnell Figure 160 series constructed of carbon steel or alloy steel plate. Select saddles to accommodate insulation thickness specified in Section 22 0700, Plumbing Insulation.

2.04 WEIGHT BEARING INSULATION INSERTS

A Insert thickness shall match pipe insulation thickness. Pipe insulation jackets shall be continuous through sections containing inserts.

B Minimum length of inserts shall be 12 inches, or 2 inches longer than insulation protection shields whichever is longer. Quantity and placement of inserts shall be based on weight of pipe and fluid plus 1.5 safety factor.

C Hot Pipes (120 degrees F and above):

1 High density calcium silicate insulation (Type H) like Johns Manville Thermo-12 or cellular glass insulation (Type-G) like Pittsburgh Corning Foamglass. Maximum compression strength for load calculation shall be 100 psi.

2 HAMFAB H-Block by ICA Inc. may be used. Maximum compression strength for load calculation shall be 30 psi.

D Cold Pipes (59 degrees F and below):

1 Cellular glass insulation (Type G) like Pittsburgh Corning Foamglass, maximum compression strength 100 psi, Koolphen K insulation by Kooltherm Insulation, 5 pounds per foot, maximum compression strength 50 psi, or HAMFAB H-Block by ICA Inc., maximum compression strength 30 psi. H-Block inserts shall be coated with vapor barrier coating like CADALAR 670 by SKIRGES Corp.

2.05 PRE-INSULATED PIPE SUPPORTS

A Pipe Shields or Rilco equal to Pipe Shields models listed.

B Insulation shall consist of water-resistant calcium silicate of same thickness as adjoining pipe insulation, thermal conductivity not more than 0.38 at 75 degrees F mean temperature, minimum density of 13 pcf, and compressive strength not less than 100 psi.

C Structural inserts shall be water-resistant, high-density calcium silicate with minimum density of 32 pcf and minimum compressive strength of 600 psi. Structural inserts shall be used as recommended by manufacturer to meet load ratings.

D Use vapor barrier steel jacket around insulation. Insulation jackets shall be galvanized steel conforming to ASTM A-527. Hanger bearing surface shall consist of galvanized sheet metal insulation protection shield or casing.

E When recommended by manufacturer, use double layer insulation protection shield at support bearing surface. Insulation shall extend one inch beyond insulation protection shield to maintain vapor barrier integrity.

F Pre-insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes and standards: ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.

G Load tests shall be made on both supporting materials and configurations. All tests shall be performed by independent testing laboratory. Results of pertinent tests shall be available on request.

H Unless otherwise indicated, use insulated pipe supports as indicated in the following schedule. Model numbers are based on Pipe Shields, Inc.

1 Pipe supported on hangers: Models A2000, A4000, A9000, D3000 and D3200.

2 Pipe supported on flat surfaces: Models A2000, A4000, A6000, A7000, A7200, and A7400.

3 Pipe supported on pipe rolls: Models A4000, A6000, A8000, A8200, and A8400.

4 Pipe supported on slides: Model “B” series.

5 A1000, A3000 or A5000 may be used for hot pipes (120 degrees F and above).

I Select proper model to conform to pipe service, support style, and support spacing.

J Submit chart or table indicating selected model along with pipe sizes, rated loads, support device types and support spacing for each piping system.

K Pipe support spacing shall be in accordance with manufacturer's recommendations, but in no case shall exceed maximum spacing indicated under hanger and support spacing in Part 3 of this section.

2.06 HANGER RODS (METALLIC)

A Rods shall conform to the latest MSS Standards except as modified herein. Furnish rods complete with adjusting and lock nuts.

B Rods shall have electro-plated zinc or hot dip galvanized finish.

C Total weight of equipment, including valves, fittings, pipe, pipe content and insulation, shall not exceed limits indicated.

D Unless otherwise indicated, size rods for individual hangers and trapeze support as indicated in the following schedule.

Maximum Load (Lbs.) (Not exceeding 650 degrees F Service Temperature)	Rod Diameter	Max. Pipe Size with Single Rod
610	3/8	2 inches
1130	1/2	3 inches

2.07 BOLTS, NUTS, STUDS AND WASHERS

A ASTM A307. Electro-plated zinc finish.

2.08 ROD ATTACHMENTS

A Grinnell Figure 290 galvanized finish.

2.09 U-BOLTS

A Grinnell Figure 137, galvanized finish.

2.10 BEAM CLAMPS

A Beam Clamps: Grinnell Figure 218, 228 and 292.

B Side Beam or Channel Clamps: Grinnell Fig. 225 or 226.

C Top Beam Clamps: Grinnell Fig. 227.

D C-Clamps: Grinnell Fig. 87, 92, or 94. Provide clamps with retaining clips.

2.11 ADJUSTABLE PIPE SADDLE SUPPORTS

A Grinnell Figure 264.

2.12 RISER CLAMPS

A Grinnell Figure 261.

B Proset system, Proseal plug and fire-fill for sleeved and cored holes.

2.13 METAL FRAMING SUPPORT SYSTEM (STRUT SYSTEM)

A Manufacturers: Unistrut, B-Line Strut Systems, Power-Strut, Superstrut, Kindorf and Hydra-Zorb.

B Channels to have epoxy paint or electro-galvanized finish.

C Channels shall not be lighter than 12-gauge.

2.14 PIPE MOUNTING PEDESTALS

A Equal to Roof Products & System Corporation consisting of equipment rail, "U" shaped mounting brackets, galvanized threaded rod and cast-iron pipe rollers. Rail to have built-in raised cant to match roof deck insulation.

2.15 EQUIPMENT RAILS

A Manufacturers: Roof Products & Systems, ThyCurb, Custom Curb, Inc., or Vent Products equal to Roof Products & Systems Model ER-4 with raised cant style. Mounting rails shall be galvanized steel with integral base plate, continuous welded corner seams, factory installed 2 x 4 wood nailer and 18-gauge galvanized steel counter flashing.

B Mounting rail gauge shall be selected to support equipment adequately but shall be not less than 18 gauge.

C Height shall be as detailed, but not less than 8 inches above finished roof.

D Equipment rails shall span minimum of 2 joists and not cantilever more than 6 inches where joists are used. Rails shall be level at top with pitch built in when deck slopes ¼ inch per foot or greater.

2.16 PIPE ROOF PENETRATION PROTECTIONS

A Manufacturers: Oatey Master Flash Roof Flashings consisting of EPDM and non-fading sealing collar.

2.17 PIPE GUIDES

A Unless otherwise indicated, guides shall be Pipe Shields or Rilco equal to Pipe Shields "B" Series B3000, B4000, B7000, B8000, selected by load and movement.

2.18 PIPE ANCHORS

A Unless otherwise indicated, anchors shall be no-moment type, Pipe Shields or Rilco equal to Pipe Shields Insulated Positive Pipe Anchor Model C3000 or C4000 Series, sized to meet all forces and moments with minimum safety factor of 3.0.

B Contractor may fabricate anchors of steel sections suitable for location of installation and for withstanding all forces and moments with minimum safety factor of 3.0.

2.19 CASEWORK PIPE SUPPORTS

A Hinged pipe clamp and Strutcatcher, nylon 12 Grilamid, Clic by Litchfield International.

B Vibration isolation pipe clamp, yellow zinc chromate finish, B-Line BVT Series Vibraclamp.

PART 3 EXECUTION

3.01 ATTACHMENT TO STRUCTURES

A Ducts are to be independently supported from building structure only, and not from equipment or other equipment supports.

B Attachments to Structural Steel, Joists or Trusses:

1 Support loads from panel points.

2 Where necessary, install supplementary steel required to bridge two panel points or two joists for transmission of load to panel points.

C Attachment to Concrete Structure:

1 Locate and install toggle type anchoring devices, inserts, and expansion fasteners for attaching hangers and hanger rods to concrete slabs prior to pouring slab.

2 Locate and install wedge type anchors for attaching hanger rods and hangers to precast concrete.

3 When general patterns of inserts are provided in waffle slab for use by all construction trades, provide and install compatible hangers.

3.02 INSTALLATION

A Install supports to allow for free expansion of piping. Support all piping from building structural members using concrete inserts, ceiling plates, wall brackets, or floor stands. At no time shall hangers and supports overload building structural members. Fasten ceiling plates and wall brackets securely to structure and test to demonstrate adequacy of fastening.

B Select and size building attachments properly in accordance with MSS Standards and manufacturer's published load rating information.

C Coordinate hanger and support installation to properly group piping of all trades.

D Suspend hangers by means of hanger rods. Perforated band iron or flat wire (strap iron) is not allowed.

E Piping shall not be supported by other piping.

F Pipe hangers or supports are not allowed to penetrate vapor barrier of pipe insulation.

G Install adequate supports during erection of piping so as not to over stress either piping or equipment to which piping is connected.

H Hangers and supports for fire protection systems shall conform to NFPA 13.

3.03 HANGER AND SUPPORT SPACING

A Space pipe hangers and supports horizontally for steel pipe (standard weight and extra strong) in accordance with the following schedule, with exceptions as indicated herein:

Pipe Size	Max Spacing
Up thru 1-1/4 inches	7 feet - 0 inches
1-1/2 inches	9 feet – 0 inches
2 inches	10 feet – 0 inches
2-1/2 inches	11 feet – 0 inches
3 inches	12 feet – 0 inches
4 inches	14 feet – 0 inches

B Maximum spacing shown above, may be restricted by strength of attachment to building structure. Submit data with calculations with published load ratings showing attachment to be utilized and maximum spacing allowable for that type of attachment utilized and pipe size.

C If pipe size changes between support points, maximum spacing shall be based on the smaller pipe size.

D Maximum hanger and support spacing for copper tubing shall be 5 feet for tubing 1-1/4 inches and under, 8 feet for 1-1/2 inches through 2-1/2 inches, and 10 feet for 3 inches and over.

E Maximum hanger and support spacing for cast iron piping shall be 10 feet for all sizes. Provide minimum of one hanger per pipe section close to joint on barrel, at each pipe fitting, at change of direction and branch connections.

F Support Cast Iron No-Hub pipe as recommended in CISPI Publication "Suggestions for Cast Iron No-Hub Pipe and Fittings."

G For non-metallic pipe, follow the manufacturer's installation recommendations.

H Maximum hanger and support spacing for polyvinyl chloride (PVC) or chlorinated polyvinyl chloride (CPVC) piping shall be 4 feet.

I Support plastic pipe at all changes of direction. Adequate consideration shall be given to piping expansion.

J Install supports for vertical piping and anchors as recommended by pipe manufacturer.

K Spacing less than indicated above may be required to conform to building structure design and/or loading limitations.

L Place hangers and supports to meet requirements of piping section of this specification, regarding pitch for drainage and venting, and clearance between services.

M Install hangers and supports to bear on outside of insulation when pipes are to be insulated.

N Place hangers and supports within one foot of either side of each fitting such as elbow and tee and at each valve, strainer, and other piping specialty for piping 4 inches and above.

3.04 RISER SUPPORTS

A Insulated Piping:

1 Unless otherwise indicated, support vertical piping as indicated below.

2 Support vertical piping at bottom of riser secured and anchored to building structure and provide guides on vertical piping. Use spring hangers at top of riser and at takeoffs from

riser at each floor. Use spring hangers for minimum 3 hangers away from top elbow and from each take off at riser.

3 Guide vertical piping 2 inches and smaller at every floor. Guide 2-1/2 inches and larger at every other floor.

B Non-Insulated Piping:

1 Unless otherwise indicated, maximum vertical support spacing for ambient bare pipes shall be 15 feet.

2 Maximum vertical support spacing for copper tubing and plastic piping shall be 10 feet.

3 Use riser clamps and intermediate supports as required.

4 Rest riser clamps on floor or on pipe sleeve.

3.05 INSULATION PROTECTION SHIELDS

A Install insulation protection shields at support points as specified under insulated pipe supports.

B Use one shield (bottom) for clevis hanger and 2 shields (top and bottom) for roller hanger/support or strap/clamp support. Apply 2 metal straps to hold shield(s) onto insulation jacket.

3.06 INSULATION PROTECTION SADDLES

A Install saddles at support points as specified under insulated pipe supports. Tack weld saddle to pipe. Pack saddle cavity with insulation, same insulation as specified for piping.

3.07 INSULATED PIPE SUPPORTS

A Install insulated pipe supports at support points of all insulated pipe.

B Pipe Size 1-1/2 inches and Smaller:

1 Use insulation protection shields. Pipe insulation specified in Section 22 0700, Plumbing Insulation shall be continuous through support points.

C Pipe Size 2 Inches and Over:

1 Use pre-insulated pipe supports.

2 In lieu of pre-insulated pipe supports, field-assembled insulated pipe supports may be used. If used, submit application details including materials, thickness, compression strength, load bearing surfaces, load calculations of support assembly and total pipe weight based on support spacing.

3 Field-assembled insulated pipe supports shall consist of weight bearing insulation inserts and insulation protection shields.

4 Insulation protection saddles may be used in lieu of assembled insulated pipe supports on roller hangers/supports for hot water pipes, low pressure steam and steam condensate pipes.

3.08 CONCRETE INSERTS

A Coordinate with Owner’s Authorized Representative for placement of inserts before concrete pour. Minimize use of inserts and anchors after concrete pour.

3.09 TRAPEZE SUPPORTS

A Construct trapeze supports with struts, angles, or channels and hang them by inserts or welded beam attachments and rods.

B Determine trapeze supports spacing by the smallest pipe on trapeze.

3.10 PIPE MOUNTING PEDESTALS

A Use for all piping on roof. Install bottom of pedestal flat on roof deck, insulate exterior of pedestal, flash, and counter flash.

3.11 EQUIPMENT RAILS

A Use for all roof mounted equipment which is not curb mounted. Install bottom of equipment rail flat on roof deck. Insulate exterior of equipment rail.

B Provide counter flashing as specified and secure to wood nailer with stainless steel truss head screws.

3.12 PIPE ROOF PENETRATION PROTECTIONS

A Install at points where pipes are penetrating roof. Install as shown and according to manufacturer's installation instructions.

3.13 PIPE GUIDES

A Install where shown on drawings.

B For manufactured expansion devices, install minimum of 2 pipe guides at each side of manufactured pipe expansion device. Locate first guide no more than 4 pipe diameters from expansion device and second guide at 14 pipe diameters from first guide. Install intermediate guides in accordance with guide spacing data recommended by manufacturer or the following table, whichever is more stringent.

MAXIMUM DISTANCE BETWEEN INTERMEDIATE GUIDES (FT)

Pipe Operating Pressure

Pipe Size (inches)	0 to 50 psig	51 to 100 psig	101 to 150 psig	151 to 200 psig
3	21	19	17	16
4	35	29	25	22
6	57	44	37	32
8	66	52	45	40
10	91	69	58	51
12	107	79	66	58
14	115	85	71	62
16	127	94	78	68

C If anchor is located within 4 pipe diameters from expansion joints, guides need not be installed on anchor side.

3.14 PIPE ANCHORS

A Install anchors where shown or in conjunction with expansion joints, loops and swing joints as required to provide proper expansion and contraction of piping without damage to structure, equipment, or piping.

END OF SECTION

22 0700

PLUMBING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A This section covers insulation for all plumbing systems.

1.02 REFERENCE

A The work under this section is subject to requirements of the contract documents including the general conditions, supplementary conditions, and general requirements.

1.03 DEFINITIONS

A Concealed areas, where indicated in this section, shall apply to furred spaces, space above finished ceilings, low tunnels, and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

1.04 SUBMITTALS

A Manufacturer’s technical data for the following:

1 Manufacturer's name

2 Schedule of all insulating materials

3 Insulation material and thickness

4 Jacket

5 Adhesives

6 Fastening methods

7 Fitting materials

8 Intended use of each material

9 Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

10 Insulation installation details (manufacturer’s installation instruction/details, contractor’s installation details, MICA plates where applicable.)

11 All other appropriate data

1.05 QUALITY ASSURANCE

A Regulatory Requirements: All products and installation must comply with the provisions of the appropriate and most recent State of Oregon code.

B Provide all insulating materials and accessories as required for mechanical systems as specified below.

C All insulating products delivered to construction site shall be labeled with manufacturer's name and description of materials.

D All insulation shall have composite (insulation-jacket- adhesive) fire and smoke hazard ratings as tested by Procedure ASTM E84, NFPA 255, and UL 723. Ratings shall not exceed flame spread 25 and smoke developed 50.

E All interior duct lining materials shall meet the life safety standards as established by NFPA 90A.

F Subcontractor shall have a minimum of 3 years' experience in ductwork insulation application.

1.06 DELIVERY, STORAGE AND HANDLING

A All insulation material shall be delivered to project site in original, unbroken factory packaging labeled with product designation and thickness. Shipment of materials from manufacturer to installation location shall be in weather-tight transportation. Insulation materials delivered to jobsite shall be stored to protect materials from moisture and weather during storage and installation. Insulation material shall be protected from long exposure to UV light from sun.

PART 2 PRODUCTS

2.01 MANUFACTURER

A Acceptable manufacturers:

1 Base:

a Owens Corning

2 Optional:

a Johns Manville

b Knauf

c Certain Teed

B Substituted products to be like product indicated except where product of another manufacturer is specifically identified for special type of insulation.

2.02 MATERIALS

A Unless otherwise indicated, all products, material itself or on a composite basis, shall meet ASTM E-84, UL 723 or NFPA 255 and shall not exceed 25 flame spread and 50 smoke developed. Products used for or related to air conditioning and ventilating systems shall conform to NFPA 90A possessing flame spread rating of not over 25 and smoke developed rating no higher than 50.

B Insulation applied on stainless steel shall meet requirements of ASTM C795 and NRC 1.36.

2.03 INSULATION

A Fire retardant, moisture, and mildew resistant, vermin proof, and suitable to receive jackets, adhesives and coatings as indicated.

B Glass fiber insulation, where indicated, shall be of inert inorganic material, non-corrosive to mechanical surfaces.

C Insulating cement shall be PK Quick Cote, or Ryder GP, with dry density of no more than 38 pounds per cubic feet and thermal conductivity of 0.63 Btu/hr-ft-F at 400 degrees F. mean temperature.

D Filling and finishing cement shall be PK Super Stik, or Ryder MW, with dry density of no more than 24 pounds per cubic feet and thermal conductivity of 0.74 Btu/hr-ft-F at 500 degrees F. mean temperature.

E Type R Insulation (Rigid Glass Fiber):

1 Minimum nominal density of 3 pounds per cubic feet with thermal conductivity of not more than 0.23 Btu/hr-ft-F at 75 degrees F mean temperature and 0.30 Btu/hr-ft-F at 200 degrees F mean temperature.

2 Pipe insulation shall be suitable for temperature to 850 degrees F and shall be Johns Manville Micro-Lok 850, Owens-Corning Fiberglass ASJ/ SSL-II.

3 Duct and equipment insulation shall be suitable for temperature to 450 degrees F (unfaced) and 350 degrees F (faced with P-1 or D-1 jacket) and shall be Johns Manville Type 814, Owens-Corning Type 703.

4 Pipe and tank wrap faced with specified jacket may be used for equipment and round ducts insulation, meeting insulation characteristics stated above and maintaining same R value as specified.

2.04 JACKETS

A Jackets puncture resistance based on ASTM-D-781 test methods. Vapor barriers perm ratings based on ASTM E-96 procedure A.

B Type P-1 Jackets:

1 Heavy-duty fire-retardant material with glass fiber reinforcing and self-sealing lap. Jacket shall have neat, white Kraft finish or white vinyl finish suitable for painting, with beach puncture resistance of 50 units minimum. Vapor barrier shall be 0.001-inch aluminum foil adhered to inner surface of jacket. Permeance shall not exceed 0.02 perms. Owens-Corning "ASJ-SSL", Johns Manville flame-safe "AP-T".

2.05 ADHESIVES, MASTIC, COATINGS, SEALANTS, AND REINFORCING MATERIALS

A Products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of systems to which they are applied.

B Products shall be fire retardant, moisture resistant, mildew resistant and vermin proof.

C Adhesives, mastic, sealants, and protective finishes shall be as recommended by insulation manufacturer for application specified.

D Glass fiber fabric reinforcing shall be 10 x 10 or 20 x 10 mesh.

E Wire mesh reinforcing shall be 22-gauge 1 inch galvanized.

F Insulation cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

G Finishing cement to be ASTM C449.

2.06 METAL BANDS AND WIRES

A Aluminum bands to be 0.5-inch x 0.020 inch up to 48 inches OD and 0.75-inch x 0.020 inch over 48 inches OD.

B Stainless steel bands to be 0.5 inch or 0.75-inch x 0.015 inch.

C Stainless steel wires to be 16-gauge.

2.07 REMOVABLE INSULATING BLANKETS

A Custom designed removable, reusable, flexible, blanket thermal insulation system.

B Acceptable Manufacturers: Thermal Energy Products, Inc., Advanced Thermal Corp. and Remco Technology, Inc.

C Removable insulation system shall be custom designed for each individual item to provide close contour fit. Overlapping seams and gaps are not acceptable.

D Removable insulation shall be designed to overlap adjoining pipe insulation by 2 inches.

E Insulation: Minimum 2 inches thick, 2.4 pounds per cubic feet density, 1000 degrees F thermal insulating wool; Owens-Corning Fiberglass or equal.

F Interior and Exterior Fabric: 17.5 ounce per square yard silicone rubber coated fiberglass cloth.

G Securement: Blanket seams shall be closed with buckle and strap assembly (D ring closure).

H Identification/Tagging: Label each removable insulation device with plastic or 304 stainless steel tag with raised letters. Tag as directed by OWNER.

PART 3 EXECUTION

3.01 APPLICATION

A Provide Insulation and jackets as indicated in the following schedule. The schedule applies to both exposed and concealed applications unless noted otherwise.

Piping System

Service	Jacket Type	Insulation Type	Insulation Thickness According to Pipe Size				
			1 inch & less	1 to 2 inches	2 to 4 inches	5 to 6 inches	8 inches & Larger
Domestic Cold Water	P-1	R	1/2 inch	¾ inches	1 inch	1 inch	1 inch
Condensate lines (interior application)	P-1	R	½ inch	½ inch			
Domestic Hot Water and Hot Water Return (105-140 degrees F)	P-1	R	1 inch	1 inch	1 inch	1-1/2 inches	1-1/2 inches

3.02 INSTALLATION - GENERAL

A All insulation installation methods shall be performed in accordance with the latest edition of National Commercial and Industrial Insulation Standards published by MICA (Midwest Insulation Contractors Association) and manufacturer's installation instructions, except as modified in this section of specifications.

B Install all products with good workmanship, with smooth and even surfaces. Use full length factory furnished material where possible, do not use scrap piecing.

C Apply insulation only on clean, dry surfaces, after all rust and scale have been removed and testing of systems has been completed. Do not insulate any section of system, which must be pressure tested until after it has been successfully tested. Any removal and reinstallation to correct system defects, prior to end of guarantee period shall be accomplished at no expense to Owner.

D Install insulating materials with necessary joints and terminations, to permit easy access and removal of equipment sections where inspection, service or repair is required, and to allow for expansion.

E Provide beveled terminations at name plates and uninsulated fittings.

F Make longitudinal joints in jackets, where possible, facing toward wall or ceiling.

G Apply insulation to each pipe or duct individually. Common insulation applied for adjacent pipes will not be accepted.

H Unless otherwise indicated, pipe insulation shall be continuous through non-rated walls and floors.

I Where multiple layers of insulation are used, stagger and secure each layer with metal bands.

J Where penetrations occur through fire-rated walls, partitions, or floors, provide fire seal as required by code.

K Insulate water piping within casework and walls up to fixture stop. Insulate water piping within walls up to pipe penetration through the wall. Termination of insulation shall be in neat and workman like manner with insulation jacket cap.

L Insulate the following systems for complete vapor barrier protection.

1 Cold Water

3.03 PIPING, VALVE AND FITTING INSULATION

A Apply insulation to pipe, unions, flanges, and fittings, valves and piping specialties with butt joints and longitudinal seams closed tightly.

B Laps on factory applied jackets shall be 2-inch minimum width firmly cemented with lap adhesive, or be pressure sealing type lap.

C Joints shall be covered with factory furnished tape (3-inch minimum width) to match jacket, firmly cemented with lap adhesive.

D Secure insulation, except those with vinyl jackets, additionally with staples.

E Where staples are used, they shall be on 6 inches maximum centers, and when used for system requiring vapor barrier, lap and staples shall be covered with finish coat of lagging adhesive.

F Built-up insulation for fittings and valves shall be made with sectional insulation, wrapped firmly to thickness of adjoining pipe insulation, and bound with jute twine, or built up with insulating cement, and finished to smooth hard surface, and covered with minimum of 9 ounces per square yard re-wettable glass cloth similar to Clairmont Diplag 60.

G For valves and fittings requiring vapor barrier, apply 2 coats of vapor barrier mastic with glass fiber reinforcing fabric, after application of insulating cement. For valves and fittings not requiring vapor barrier, apply 2 coats of weatherproof mastic with glass fiber reinforcing fabric, after application of insulating cement. Apply coating in accordance with manufacturers recommended procedure.

H For finishing of insulated pipe fittings and valves where P-1 jacket is specified, and surface temperature of insulation is not higher than 125 degrees F, one-piece PVC fitting covers, minimum thickness of 20 mil, may be used. Johns Manville Zeston 2000 PVC, PROTO Fitting Covers, or similar by other manufacturers listed. Where fitting and valve insulation needs vapor barrier, seal joints of PVC covers with vapor barrier adhesives. Insulation type and "R" value of fittings shall match adjacent piping.

I Where terminations of pipe insulation are required, insulation shall have tapered ends, built up and finished as specified for fittings.

J For pipes 1-1/2 inches and smaller, specified pipe insulation and jacket shall be continuous through hanger or support locations and insulation protection shields shall be provided to protect insulation from compressing.

K For pipes 2 inches and larger, where manufactured pre-insulated pipe supports are used at hanger or support locations, extend insulation to insulated pipe supports. Where vapor barrier is required, this contractor shall be responsible for continuity of vapor barrier at insulated pipe supports. Use 3-inch wide vapor barrier tape on all hot and cold systems at pipe supports.

L For pre-insulated pipe supports and insulation protection shields, refer to Section 22 0529, Hangers and Supports for Piping and Equipment.

M For contractor fabricated anchors, secure insulation directly to pipe surface and extend up anchor for distance of 4 times insulation thickness. For pre-insulated anchors, cover entire surface of anchors with Type A insulation. Take special care to assure vapor seal at anchor.

N Where mechanical grooved pipe connections are used in piping system, insulate couplings as specified for pipe.

END OF SECTION

22 1100

PIPING AND VALVES

PART 1 GENERAL

1.1 DESCRIPTION

A This section covers all pipe and pipe fittings and incidental related items as required for complete piping systems.

1.2 REFERENCE

A The work under this section is subject to requirements of the contract documents including the general conditions, supplementary conditions, and requirements.

1.3 SUBMITTALS

A Manufacturer’s technical data for the following:

1 Pipe.

2 Fittings.

3 Joints.

4 Valves.

5 Unions.

6 Dielectric fittings.

7 Water hammer arrestors.

B Certificates: Submit performance testing certificates for reduced pressure backflow preventers and double check backflow preventers.

1.4 QUALITY ASSURANCE

A Order pipe with each length marked with manufacturer's name or trademark and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and supplier's name.

B Installed material not meeting specification requirements must be replaced with material that meets these specifications without additional cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A Promptly inspect shipments to ensure material is undamaged and complies with specifications.

B Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends from damage. End caps shall remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C Offsite storage agreements will not relieve contractor from using proper storage techniques.

D Storage and protection methods must allow inspection to verify products.

E Before shipping, piping shall be cleaned, free of rust and scale, and chemically treated to protect inside of pipe from rusting and furnished with end caps.

PART 2 PRODUCTS

2.1 MATERIALS

A Materials herein specified shall be new unless otherwise noted.

2.2 PIPING

A Water Piping, Below Grade:

1 Copper Tubing: ASTM B88, Type K, hard tempered.

a Fittings: ASME B16.22 wrought copper and bronze.

b Joints: ASTM B32, Solder Grade 95TA.

B Water Piping, Above Grade:

1 Copper Tubing: ASTM B88, Type L, hard tempered.

a Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

b Joints: Lead free (<0.2 percent) solder, Bridgit or Silvabrite, ASTM B32, solder Grade 95TA; flux, ASTM B813.

c Nipples: Red brass pipe, threaded.

C Mechanically Formed Tee Connections and Couplings:

1 Mechanically formed fitting system of drill, expansion, and brazing of copper water tube may be provided conforming to the system (T-Drill) listed under National Standard, IAMPO, SBCC, BOCA Plumbing Codes, and Underwriters.

2 Joints shall be brazed in accordance with American Welding Society lap joint weld, and Copper Development Association Copper Tube Handbook using BCup Series filler metal. (Note: Soft soldered joints are not permitted.)

D CDA Piping:

1 Steel: ASTM A53 Grade B, seamless or ERW, Schedule 40.

2.3 UNIONS AND FLANGES

A General:

1 Unions, flanges, and gasket materials to have pressure rating of not less than 150 psig at 180 degrees.

B Copper 3 inches and smaller:

1 Wrought copper union, Nibco Figure 733. Mueller Brass or equal.

2.4 VALVES

A Shutoff Valves:

1 Ball Valves:

a Acceptable manufacturer: Apollo.

1) Full Port, 2 Piece: Bronze body, stainless steel ball, Teflon seats, stem extension, 600 psi WOG pressure rating.

2) Full Port, 3 Piece: Bronze body, chrome plated bronze ball, Teflon seats, stem extension, 600 psi WOG pressure rating.

2 Butterfly Valves:

a Acceptable Manufacturer: Stockham or Grinnell.

b Lug Type: Ductile iron body, aluminum bronze disc, EPDM liner, 316 stainless steel stem, brass bushings (lower, upper and collar), 200 psi WOG pressure rating, lever handle through 6 inches, gear operator 8 inches and larger.

3 Gate Valves:

a Acceptable Manufacturer: Nibco

b Size 4 Inches and Larger: Iron body, bronze trim, outside screw and yoke (OS&Y), 125 psi steam pressure rating, bolted bonnet, flanged pipe ends.

B Check Valves:

1 Size 3 Inches and Smaller:

a Acceptable Manufacturer: Nibco

b Bronze body, Y pattern, Buna N resilient disc, horizontal swing, 200 psi WOG rating, Nibco 413.

2 Valves 4 Inches and Larger:

a Acceptable Manufacturer: Nibco.

b Iron body, horizontal swing, cast bronze disc and seat, 200 psi WOG rating, Nibco F 918.

C Balancing Valves:

1 Present for gpm indicated with threaded ends. Acceptable manufacturers: Griswold or pre-approved equal.

2.5 DIELECTRIC FITTINGS

A Insulating nipple, metal casing, inert thermoplastic lining, Clearflow dielectric fitting by Perfection Corporation.

2.6 WATER HAMMER ARRESTORS

A Mechanical Shockstops:

1 Piston-compressed air column type, with sealed air chamber.

2 Manufacturers: Watts, Sioux-Chief, and Precision Plumbing Products (PPP), Inc., equal to size shown. Provide access panels when mechanical shockstops are installed in non-accessible concealed locations.

PART 3 EXECUTION

3.1 INSTALLATION (COPPER)

A Install pipe and fittings in accordance with reference standards, manufacturer's recommendations, and recognized industry practices.

B Include connections to plumbing fixtures, to equipment by others, and to equipment requiring water. Provide proper backflow and back siphonage protection to safeguard potable water system from contamination.

C Lay out water system to conform to intent of drawings. Coordinate piping with building features and work of other trades. Plans indicate general routing, provide additional offsets as required. Install piping with necessary swing joints and offsets to allow for expansion. Install shut-off valves on branch lines near mains to avoid long dead-leg branches when valves are closed.

Install water piping plumb and square with building. Pitch water pipe to drain with drain valves at low points.

D Install shut-off valves where indicated and at base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

E Protect all copper piping and plastic tubing routed through framing members within one inch of the exposed framing with steel nail shields not less than 18 gauge.

F Provide protective sleeve covering of ½ inch thick elastomeric pipe insulation where copper or steel piping is embedded in masonry or concrete

G Provide dielectric fittings between dissimilar piping materials.

H Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless piping is serving this equipment.

I Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to equipment, fixtures and systems installed by others where, same requires piping services indicated in this section.

J Install water pipe using proper pipe and fittings. Use reducing fittings for changes in pipe size.

K Copper Pipe Joints:

1 Use non-acidic and lead-free flux on cleaned pipe and fittings for soldered joints. Cut pipe square and ream before assembly. Fill joints with solder by capillary action. Solder shall cover joint periphery. Wipe joint clean. Apply heat carefully to prevent damage to pipe, fittings, and valves. Follow manufacturer's recommendations when heating valves and equipment for soldered connections.

L Mechanically Formed Tee Fittings:

1 Form mechanically extracted collars in continuous operation consisting of drilling pilot hole and drawing out tube surface to form collar having height of not less than 3 times thickness of tube wall. Use adjustable collaring device. Notch and dimple branch tube.

2 To form couplings, anneal end of tubing to be expanded - insert expander and reform tube to accept size OD. Socket expansion shall be at least 3 times base tube wall thickness in depth.

3 Braze joints and couplings in accordance with American Welding Society "lap-joint" weld, and Copper Development Association copper tube handbook using BCup filler metal. (Note: Soft soldered joints will not be permitted.)

M Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

N Install drains at low points in piping system mains and elsewhere as required for system drainage. Drains shall consist of a tee fitting, NPS 3/4-inch ball valve, and short NPS 3/4-inch threaded nipple with cap. Slope piping at a uniform grade of 0.2 percent upward in direction of flow.

O Use mechanical shockstops to control water hammer. Installed shockstops shall be sized and located according to manufacturer's recommendations or as shown on drawings.

P Use shockstops with quick-closing valves and at top of risers.

Q Provide access panels when mechanical shockstops are installed in non-accessible concealed locations.

R Provide pipe insulation per specification section 22 0700, Plumbing Insulation.

3.2 DIELECTRIC UNIONS AND FLANGES

A Install dielectric unions or flanges at points where copper-to-steel pipe connection is required in domestic water systems.

B Install unions on equipment side of shutoff valves for items such as: water heaters, pumps, filters, and similar equipment requiring periodic replacement.

C Install temporary plugs and caps on openings during construction phase.

3.3 CLEANING

A Flush and clean piping prior to testing. Remove corrosion by mechanical or chemical means. Use chemicals that are non-toxic.

3.4 TESTING

A Water test system may be applied to system in its entirety or in sections. Test piping with water to pressure of 150 psi for 2 hours. No decrease in pressure allowed. Provide pressure gauge with shutoff and bleeder valve at highest point of system tested. Inspect joints in system under test.

1 Defective work or material shall be replaced or repaired as necessary and inspection and test repeated. Repairs shall be made with new materials. No caulking of threaded joints or holes will be allowed.

2 Do not conceal pipe until satisfactorily tested.

3 Testing with air will not be allowed.

3.5 BALANCING

A Balance water distribution system. Adjust control valves for proper operation. Set balancing valves to maintain hot water in hot water system.

B Balance flush valves, flow control valves and mixing valves for adequate flow and temperature to plumbing fixtures and equipment.

3.6 DISINFECTION

A Disinfect water piping in the following manner:

1 Clean and flush water pipe with water until water at remote tap is clear.

2 Fill water systems with solution containing 50 ppm of chlorine (minimum concentration). Allow solution to stay in water system for 24 hours. Alternately use solution of 200 ppm of chlorine (minimum concentration) for 3 hours.

3 Flush water system of chlorine solution.

4 Allow clean water to stand in system for 24 hours. Take sample from remote tap for bacteriological test.

B Do not use water system for potable water supply until safe bacteriological test is obtained. Repeat steps 1 through 4 until safe water system is obtained.

3.7 BACTERIOLOGICAL TESTS

A Take representative water samples from water piping and test to ensure bacteriologically safe water supply system. Include HPC test and test for presence of Pseudomonas aeruginosa as well as regular coliform bacteria test. HPC test maximum containment level of 500 organisms/ml. Perform bacteriological tests shortly before Substantial Completion. If tests fail, make corrections and retest.

END OF SECTION

22 4000

PLUMBING FIXTURES

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes plumbing fixtures, fixture trim, drainage products, and miscellaneous plumbing items.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 22 0500, Common Work Results for Plumbing

1.03 REFERENCES

A ADAG: Americans with Disabilities Act Guidelines

B ANSI: American National Standards Institute

1 ANSI A112.19.3: Stainless Steel Plumbing Fixtures

2 ANSI Z358: Emergency Eyewash and Shower Equipment

1.04 SUBMITTALS

A For each item specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A Drainage Products: J.R. Smith, Josam, Zurn, or pre-bid approved equal.

B Plumbing Fixtures: American Standard, Kohler, or pre-bid approved equal.

C Security Fixtures: Acorn, or pre-bid approved equal.

D Fixture Trim: Dhilazo, McGuire, or pre-bid approved equal.

E Fixture Supports and Carriers: J.R. Smith, or pre-bid approved equal.

F Seats: Bemis, Olsonite, Church, Beneke, or pre-bid approved equal.

G Service Sinks (including brackets and hangers): Fiat, Mustee, Williams, or pre-bid approved equal.

H Faucets: Chicago, Delta, or pre-bid approved equal.

I Stainless Steel Products: Elkay, Just, or pre-bid approved equal.

J Flush Valves: Sloan, or pre-bid approved equal.

K Electronic Sensor Urinals: Sloan, or pre-bid approved equal.

L Mixing Valves: Leonard, Watts, or pre-bid approved equal.

M Exposed Waste and Supply Piping Insulation Kits: Truebro, McGuire, or pre-bid approved equal.

2.02 FIXTURE TRIM

A Supply Stops: Cast brass rigid riser supplies with loose key angle stops, canopy flanges, all chrome plate finish. Chicago No. 1010, equivalent NPT McGuire, or pre-bid approved equal.

B Traps:

1 For floor drains, provide coated cast iron P-trap; recessed, screw jointed, or bell and spigot.

2 For other fixtures, provide 17-gauge, chrome plated tubing P-traps with solder bushings.

C Support Rims: Hudee stainless steel rims, or pre-bid approved equal, if sink not furnished with integral rim.

2.03 SEALANT

A Hydroment Ultra-Set Sealant by Bostik, Inc., or pre-bid approved equal.

2.04 PLUMBING FIXTURES

A As scheduled on drawings.

PART 3 EXECUTION

3.01 FIXTURE TRIM

A Provide plumbing fixture trim where applicable on fixtures.

B Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

C Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

3.02 PRIMING VALVES

A Floor drain traps shall be primed from priming valves with 3/8-inch copper pipe.

B Where priming valves are installed in finished rooms, conceal in wall, and provide access panel.

3.03 TESTING

A Check out, start up, and test the following items:

1 Mixing valves.

END OF SECTION

23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 DESCRIPTION

A The intent of the Division 23, Heating, Ventilating, and Air-Conditioning (HVAC) specifications and the accompanying drawings is to provide complete and workable systems as shown, specified, and required by applicable codes. Include all work specified in Division 23, Heating, Ventilating, and Air-Conditioning (HVAC) and shown on the accompanying drawings.

B The drawings that accompany the Division 23, Heating, Ventilating, and Air-Conditioning (HVAC) specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Follow the drawings as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the building, subject to approval, and without additional cost to the contract.

1.02 REFERENCES

A FM: FM Global

B NEMA: National Electrical Manufacturers Association

1 NEMA MG1: Motors and Generators

C OSHA: Occupational Safety and Health Administration

1.03 QUALITY ASSURANCE

A Materials and equipment shall be new. Work shall be of good quality, free of faults and defects.

B All equipment shall fit in the space provided.

C Systems shall be built and installed to deliver their full rated capacity at the efficiency for which they were designed.

D Systems shall operate at full capacity without objectionable noise or vibration.

E Materials and Equipment:

1 Each piece of equipment provided shall meet all detailed requirements of the drawings and specifications and shall be suitable for the installation shown.

2 Where two or more units of the same class of equipment are provided, use products of the same manufacturer; component parts of the entire system need not be products of the same manufacturer.

F Workmanship:

1 Install all materials in a neat and workmanlike manner.

2 Follow manufacturer’s directions. If they conflict with the contract documents, obtain clarification before starting work.

G Cutting and Patching:

1 Cutting, patching and repairing for the proper installation and completion of the work specified in this division, including plastering, masonry work, concrete work, carpentry work, firestopping, and painting, shall be performed by skilled craftsmen of each respective

trade in conformance with the appropriate division of work. Additional openings required in building construction shall be made by drilling or cutting.

2 Fill holes which are cut oversize so that a tight fit is obtained around the objects passing through.

3 Do not pierce beams or columns without permission of the and then only as directed.

4 New or existing work that is cut or damaged shall be restored to its original condition. Where alterations disturb existing finishes, the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.04 SUBMITTALS

A General:

1 Comply with the requirements of Section 01 3000, Administrative Requirements, and the additional requirements specified herein.

B Shop Drawings:

1 The contract drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions is required. For this purpose, submit shop drawings of all installations not detailed on the contract drawings, and of all changes to the contract drawings.

C Product Data:

1 Submit product data for review on all scheduled pieces of equipment, equipment requiring electrical connections or connections by other trades, and as required by the contract documents. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.

2 List the name of the motor manufacturer and service factor for each piece of equipment.

3 Indicate equipment operating weights including bases and weight distribution at support points.

4 In the case of equipment specified by specific catalog number, such as wiring devices, time switches, valves, etc., a statement of conformance will suffice.

D Operation and Maintenance Data:

1 Submit operation and maintenance data for review on all scheduled pieces of equipment, and as required by the contract documents.

1.05 PROJECT CONDITIONS

A Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

PART 2 PRODUCTS

2.01 SEALANT

A General Purpose: Tremco Dymeric Sealant, or equal.

2.02 ELECTRICAL EQUIPMENT

A General: All equipment and installed work shall be as specified under Division 26, Electrical.

PART 3 EXECUTION

3.01 CLEANING

A Clean HVAC equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

3.02 EQUIPMENT PRTOTECTION

A Keep HVAC pipe, ductwork and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect HVAC piping, conduit, ductwork, and equipment against dirty water, chemical, or mechanical damage both before and after installation. Restore damaged or contaminated piping, conduit, and equipment to original conditions or replace at no added cost to the contract.

B Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C Cover or otherwise suitably protect equipment and materials stored on the job site.

D Provide filters at all openings in operating systems on return or exhaust ductwork.

3.03 ELECTRICAL EQUIPMENT

A No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be in the dedicated electrical space around electrical equipment.

B The area above the dedicated electrical space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.

C Unions in mechanical piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings.

D Low point drains in mechanical piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings. If this cannot be avoided, the low point drain connection shall be extended outside of the electrical or IT space.

E Outdoor electrical equipment shall be protected from accidental spillage or leakage from piping systems.

3.04 ADJUSTING AND CLEANING

A Before operating equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made properly and that recommended lubricants have been used.

B Use particular care in lubricating bearings to avoid blowing out seals from over-lubrication. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

END OF SECTION

23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes the following:

1 Hangers, supports, and anchors for equipment, tanks, ductwork, and piping systems.

2 Supplementary steel for support or attachment of tanks, equipment, ductwork, and piping to general construction elements of the project.

1.02 REFERENCES

A ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

1 ASHRAE Chapter 41: Absorption, Cooling, Heating, and Refrigeration Equipment

B ASTM: American Society for Testing and Materials

1 ASTM A36: Standard Specification for Carbon Structural Steel

C SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

1.03 SUBMITTALS

A Product Data: For all products specified herein.

B Shop Drawings:

1 Submit shop drawings of Contractor-fabricated piping support structures, pipe racks, and anchors.

2 Suspended Piping and Ductwork: Indicate point loads and support locations, along with applicable details keyed to layouts.

3 Support Frames, Piping, Tank, and Equipment Supports, and Anchorage: Indicate point loads and support locations, along with engineers' calculations and details keyed to the layouts pertaining to supports, support frames, and anchorages.

4 Supplementary Steel: Show details of fabrication and installation. Indicate materials, thicknesses, gauges, sizes, dimensions, methods of joining and fastening, welds, finishes, details of reinforcement and embedment, attachments, anchorages, miscellaneous metal items incidental to basic fabrication shown, provisions for work of other trades, and other pertinent information. Submit structural calculations for necessary supplementary steel for supports, anchors, and attachment of equipment, pipes, and ducts to general construction. Calculations shall be prepared and stamped by a registered professional structural engineer licensed in the state of Oregon.

5 As-constructed drawings and data.

1.04 QUALITY ASSURANCE

A Supports and hangers for piping systems subject to expansion and contraction shall be chosen with careful consideration. The hanger support type selection depends on the directions in which the piping system will expand.

PART 2 PRODUCTS

2.01 SUPPORTS AND ANCHORAGE

A Provide pipe and equipment hangers and supports in accordance with the following:

1 When supports and anchorages for tanks, equipment, conduit, piping, and ductwork are not shown on the drawings, the Contractor shall be responsible for their design.

2 Supports and anchorages shall resist forces due to hydraulic testing and seismic forces as specified in the OSSC for the ground motion accelerations corresponding to the project location. Design exterior equipment, ducts, and piping to resist wind loads.

3 Supports and anchorages shall not introduce stresses in the piping caused by thermal expansion or contraction.

4 Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B The following engineered support systems shall be designed, detailed, and bear the seal of a registered professional structural engineer licensed in the state of Oregon:

1 Supports, floor and roof-mounted tanks, and supports for suspended tanks and equipment.

2 Support frames, such as pipe racks or stanchions, for piping and equipment which provide support from below.

3 Tank, equipment, and piping support frame anchorage to supporting slab or structure.

2.02 SUPPORTS, GENERAL

A Acceptable Manufacturers: B-Line Systems, Anvil, Powerstrut and Kinline, Superstrut, Unistrut, or equal.

B Fabricate support members from welded standard structural shapes, pipe, and plate. Carry the necessary rollers, hangers, and accessories as required. Piping less than 4-inch pipe size may be supported from or by prefabricated roll-formed channels as specified in this section with necessary accessories to adequately support piping system.

C Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

D Dissimilar Metal Protection: Cush-a-Strip, Hydra-Zorb cushions, or equal.

E Attachments to roof and floor decks to support dead loads are not allowed except as described in Part 3. Attachments to decks to support transient loads shall consider the effects of deck deflection.

F All exterior materials shall be hot dip galvanized or stainless steel.

G Lateral Load Design Criteria:

1 Seismic:

a Refer to structural load data.

2 Wind:

a Refer to structural load data.

2.03 PIPE ATTACHMENTS

A Acceptable Manufacturers: B-Line Systems, Elcen, Anvil, Michigan Hanger, Superstrut, Telco, or equal.

B Clamps: Superstrut Series 700 through 702.

C Insulated Horizontal Steel Piping:

1 Chilled Water, 2 Inches and Under: Anvil 65 with Figure 167 shield.

2 Chilled, Over 2 Inches: Anvil Figure 260 with Figure 167 shield.

3 Other, 2 Inches and Under: Anvil Figure 65 with Figure 167 shield.

4 Other, Over 2 Inches: Anvil Figure 260 with Figure 167 shield.

D Uninsulated Horizontal Steel Piping:

1 2 Inches and Under: Anvil Figure 65.

2 Over 2 Inches: Anvil Figure 260.

E Insulated Horizontal Copper Piping:

1 Chilled Water, 2 Inches and Under: Anvil Figure 65 with Figure 167 shield.

2 Chilled Water, Over 2 Inches: Anvil 260 with Figure 167 shield.

F Uninsulated Horizontal Copper Piping:

1 2 Inches and Under: Anvil Figure CT65, CT69.

2 Over 2 Inches: Anvil Figure CT65.

G Riser Clamps, Steel and Cast-Iron Pipe: 3/4-inch to 20-inch, Anvil Figure 261.

H Riser Clamps, Copper Pipe: Anvil Figure CT-121.

2.04 PROTECTION SHIELDS

A Select protection shields based on actual outside diameter of pipe plus insulation. Use protection shields at hanger or roller assemblies on chilled or cold-water piping, where hangers are installed around insulation, and on both sides of clamps or U-bolts where installed around insulation. Use Anvil Figure 167, or equal.

2.05 BUILDING ATTACHMENTS

A Acceptable Manufacturers: B-Line Systems, Elcen, Anvil, Superstrut, Telco, or equal.

B Beam Hangers – Beam Clamps: Anvil Figure 218, adjustable malleable iron beam clamp, or Figure 228, adjustable forged steel beam clamp.

C Beam Hangers – C-Type Clamps: Anvil Figure 93. Sized for required rod to support load being carried.

D Beam Hangers – Welded: Anvil Figure 66. Sized for required rod to support load being carried.

E Inserts:

1 Malleable iron or steel inserts, Superstrut M-732CB or S. Inserts sized for required rod to support load being carried.

2 Malleable iron or steel inserts, Grinnell, Figure 152. Inserts sized for required rod to support load being carried.

F Expansion Plugs: Similar and equal to Phillips “red-head” self-drilling flush shell, selected for safety factor of 4.

2.06 PIPE ANCHORS

A Fabricate from steel plate as detailed (steam, condensate, pumped condensate, and hot water).

B Insulated Pipe Anchors:

1 Acceptable Manufacturers: Pipe Shields Inc., Rilco, or pre-bid approved equal.

2 Insulated pipe anchors shall maintain vapor barrier and a positive axial, lateral, and vertical stop.

a Steel Inner Thrust Plates: Welded attachments, material shall be compatible with pipe, shipped loose.

b Structural Inserts: High-density calcium silicate, compressive strength 600 psi minimum. Asbestos-free treated with water repellant.

c Jackets: Galvanized steel.

d Steel Straps Base and Outer Thrust Plates: Carbon steel.

e Fasteners: Cadmium plated.

3 The anchor shall bear the piping system design load. Pipe Shields models C4000 through C4300.

PART 3 EXECUTION

3.01 HANGERS AND SUPPORTS

A General:

1 Install all support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the drawings.

2 Provide adjustable hangers complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., for all pipes, except where specified otherwise.

3 Size hangers to clear insulation for piping services conveying liquids less than 70 degrees F.

4 Support fire protection piping independently of other piping.

5 Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods. Do not use tape for isolation.

6 Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

7 Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.

8 Install piping systems in accordance with SMACNA standards.

B Vertical Piping:

1 Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.

2 Riser clamps shall be directly under fitting or welded to pipe.

3 Risers shall be supported at each floor of penetration.

4 Provide structural steel supports at the base of pipe risers. Size supports to carry all forces exerted by piping system when systems are in operation.

C Horizontal Piping:

1 On all insulated piping, provide insulation protection shields at all roller locations.

2 Cold and Hot Piping Systems:

a Install hangers outside of insulation.

b On all piping, provide insulation protection shields at each hanger location.

D Trapeze Hangers: Multiple-pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary supporting steel.

1 Channels: Unistrut with electro-chromate finish, or equal.

E Hanger Spacing: Provide hangers at minimum spacing in accordance with Chapter 41, ASHRAE Guide and as follows:

1 Steel Pipe, Copper Tubing: For straight runs of horizontal piping with no concentrated loads such as valves, flanges, expansion joints, or other components. Sections of piping with concentrated loads will have to be considered carefully and a determination made as to appropriate spacing and rod size for the given situation.

Pipe Size	Max. Span Steel	Max. Span Copper	Rod Size
1 inch and smaller	7 feet	5 feet	3/8 inches
1-1/4 inches to 2 inches	8 feet	8 feet	3/8 inches
2-1/2 inches to 3 inches	11 feet	9 feet	½ inches

2 Maximum Rod Load: Below are maximum loads for hanger rods based on Chapter 41 of ASHRAE Guide and as follows for ASTM A36, with a safety factor of 5.

Nominal Rod Diameter	Load
3/8 inches	610 pounds
½ inches	1,130 pounds
5/8 inches	1,810 pounds
¾ inches	2,710 pounds
7/8 inches	3,770 pounds
1 inch	4,960 pounds

F Insulation Protection:

1 Where piping is suspended from insulation, provide 16-gauge galvanized steel protection shields, 12 inches long.

2 Where pipe clamps are installed on insulated piping, provide 16-gauge galvanized steel protection shields, 12 inches long on both sides of insulated pipe.

3 Band shields firmly to insulation to prevent slippage.

G Building Attachments:

1 Where possible, support all piping and equipment from structural members, beams, and joists.

2 Provide structural steel angles, channels, or other members to support piping and equipment where structural members do not occur as required for proper support.

3 Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points or provide web reinforcing as required.

4 Provide transverse and longitudinal bracing on piping at 75-foot intervals to provide a stabilized piping system. Bracing shall not introduce stresses in the piping system caused by thermal expansion or contraction.

5 Do not fasten or attach to unfilled steel roof deck structure.

6 Attach to concrete-filled steel floor deck structure for loads up to 400 pounds. Loads larger than 400 pounds shall be designed per code. Submit structural calculations stamped and signed by a structural engineer licensed in the State of Oregon showing that the concrete-filled floor deck has sufficient capacity to support the load at the points of anchorage.

H Pipe Racks:

1 General: Provide racks as shown with additional elements to adequately support piping.

2 Coordination: Where mechanical piping, tubing, etc., and electrical conduit, wiremold, wireways, etc., follow common routings, coordinate routing. Allow sufficient clearance to adequately operate, access, and maintain all devices without dismantling racks.

I General: Support all piping within 2 feet of change of direction on both sides of fitting.

J Insulated Pipe Anchors: Apply a wet coat of vapor barrier on all butt joints and seal the joints with a minimum of 3-inch-wide vapor barrier tape or band.

END OF SECTION

23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes the identification of valves, piping, and equipment components of the mechanical systems to indicate their function and system served.

1.02 REFERENCES

A ANSI: American National Standards Institute

1 ANSI A13.1: Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

A Product Data: Submit product data for products specified herein.

B Equipment Nameplate Directory: Submit for approval prior to fabrication of labels.

C Include copy of valve tag and equipment nameplate directories in each set of operation and maintenance manuals.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

A Nameplates:

1 Tag all air supply units and other miscellaneous items of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch-thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.

2 Identify unit with code number as shown on drawings and area served.

PART 3 EXECUTION

3.01 EQUIPMENT IDENTIFICATION

A Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B Nameplate Directory: Post final copy in operation and maintenance manual.

END OF SECTION

23 0593

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes adjustment, testing, and balancing of air systems, hydronic systems, and miscellaneous mechanical equipment.

1.02 QUALITY ASSURANCE

A Industry Standards: Testing, adjustment, and balancing shall be conducted in a manner recognized by the AABC and recorded on forms like those published by the AABC.

B Instrument Certification: All instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.

1.03 SUBMITTALS

A Submit the following:

1 Balancing Log: Include all air and water outlets, actual field-measured air and water volume and percentage of design volumes. Provide drawings identifying locations of all outlets

2 Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.

3 Additional Data: Submit all additional data as provided by AABC Standard forms.

4 Instrument Certification: When requested, submit certificate of calibration for all equipment to be used.

5 Commissioning Plan: Submit commission plan prior to preforming work. Commissioning to comply with the State of Oregon code requirements.

1.04 PROJECT CONDITIONS

A Do not perform testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed, operational testing of control system is complete.

B Conduct testing and balancing with clean filters in place.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 AIR SYSTEMS

A General: Measurements shall be in accordance with recognized procedures and practices of the AABC. Record on appropriate forms.

B Preliminary:

1 Identify and list size, type, and manufacture of all equipment to be tested, including air outlets and inlets.

2 Use manufacturer’s ratings for equipment to make required calculations except where field test shows ratings to be impractical.

C Execution:

1 Adjust fan speeds and motor drives for required air volume, within plus 5 percent maximum. Set speed to provide air volume at farthest run without excess static pressure.

D Distribution:

1 Read and adjust all air outlets to design air volumes, within plus 10 percent maximum.

2 Evaluate all building and room pressure conditions to determine adequate supply and return air conditions.

3 Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.

4 Mark all balancing dampers.

E Commissioning:

1 Provide two hard copies of commissioning report in 3-ring binder and digital copy.

a Include T&B report.

b Operation and Maintenance Manuals.

c Sequence of Operations.

d Commissioning Checklist.

3.02 COORDINATION

A Coordinate work between balancing agency and other trades to ensure rapid completion of the project.

B Engage the balancing agency to assist with:

1 Checkout, startup, calibration of instrumentation, and operational, functional, and final acceptance test plans, procedures, checklists, and reports.

2 Development of systems manuals.

3 Development of operation and maintenance manuals and training plan.

C Deficiencies noted during air balancing in the mechanical installation shall be promptly reported to the owner’s representative to allow corrective action to proceed.

END OF SECTION

23 0719

HVAC INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes insulation for piping, ductwork, and equipment.

1.02 REFERENCES

A ASTM: American Society for Testing and Materials

1 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

2 ASTM C1071: Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)

3 ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials

1.03 QUALITY ASSURANCE

A Regulatory Requirements:

1 Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.

2 Energy Codes: Oregon Zero Energy Ready Commercial Code shall govern where requirements for thickness exceeds thickness specified.

B Protection: Protect against dirt, water, chemical or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost to the contract.

C Source Quality Control:

1 Service: Use insulation specifically manufactured for service specified.

2 Labeling: Insulation labeled or stamped with brand name and number.

3 Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping or ductwork, and shall be asbestos free.

1.04 SUBMITTALS

A Product Data: Submit product data for each type of insulation, including density, conductivity, thickness, jacket, vapor barrier, flame spread, and smoke developed indexes.

B Shop Drawings: Submit shop drawings detailing installation of insulation for the following:

1 Removable covers for pump casings, accesses, etc.

2 Expansion joints.

3 Acoustical insulation including construction and installation of stainless-steel jacket.

PART 2 PRODUCTS

2.01 GENERAL

A All insulation shall be of one manufacturer.

2.02 PIPE INSULATION

A Elastomeric: Expanded closed cell, 0.27 per inch maximum K-factor at 75 degrees F mean temperature and 220 degrees F maximum service rating with fitting covers. Armstrong Armaflex II, or equal.

2.03 BLOCK INSULATION

A Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 6 pcf nominal density, 0.23 per inch maximum K-factor at 75 degrees F mean temperature and 450 degrees F minimum service rating. CertainTeed industrial board, or equal.

2.04 BLANKET INSULATION

A Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 1.0 psf nominal density, 0.27 per inch maximum K-factor at 75 degrees F mean temperature, 250 degrees F minimum service rating. CertainTeed, Standard Duct Wrap, or equal, with facing as follows:

1 Exposed: ASJ all-purpose facing with white Kraft paper finish, or equal.

2 Concealed with vapor barrier: FSK reinforced foil and paper, or equal.

3 Concealed without vapor barrier: Facing not required.

2.05 ACCESSORIES

A Adhesives:

1 Fiberglass: Johns Manville Zeston, Z-Glu, or equal.

2 Calcium Silicate: Benjamin Foster 30-36, or equal.

3 Elastomeric: Armstrong 520, or equal.

4 Duct Insulation, Internal: Benjamin Foster 85-20, or equal.

B Weld Pins: Duro-Dyne, with NC-1 nylon stop clips, or equal.

C Cements:

1 Insulating: Ryder, or equal.

2 Heat Transfer: Johns Manville Zeston Z-20, or equal.

D Wire Mesh: 1-inch mesh with 20-gauge annealed steel wire.

E Pipe Fitting Covers: One-piece PVC insulated pipe fitting covers. Johns Manville Zeston, Ceel-Co, or equal.

F Grooved Coupling Insulation: One-piece PVC insulated fitting cover. Johns Manville Zeston, Ceel-Co, or equal.

G Insulation Protection Saddles: 12-inch long, 16-gauge steel. All piping with insulation shall be Anvil Fig. 167, galvanized, or equal.

H Mastic: Chicago Mastic, or equal:

1 Vapor Barrier: 17-475.

2 Outdoor Mastic: 16-110 white.

I Metal Pipe Jacket: 0.020-inch thick stainless-steel jacket with form-fitting covers, stainless steel snap straps and sealant.

J Cloth Facing: Pre-sized fiberglass cloth.

K Tapes: Pressure sensitive, weather resistant and for temperatures up to 150 degrees F and complies with UL 181. Zeston Z-tape, or equal.

PART 3 EXECUTION

3.01 GENERAL

A Applicators: Applicators shall be employed by a firm that specializes in insulation work.

B Preparation: Surfaces of piping, equipment, and ductwork shall be clean, free of oil or dirt, and dry before insulation is applied.

C Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

D Any insulation that becomes damaged, water soaked, or stained shall be replaced at no additional cost to the project.

3.02 PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A Insulate the following piping systems with glass fiber insulation, all-purpose jacket in thickness listed.

B Insulate the following piping systems with elastomeric insulation in thickness listed:

1 Refrigerant Hot Gas and Liquid Suction – 1-inch thickness with vapor barrier.

C Insulation shall include all fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, and piping through sleeves.

3.03 PIPING INSTALLATION

A General:

1 Joints: Coat both sides of complete joining area with applicable adhesive.

a Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except for foam plastic, seal with closure system or 3-inch-wide tape.

b Butt Joints: Butt tightly together and, except for foam plastic, seal with 3-inch-wide tape or butt straps.

c Multiple Layered Insulation: Joints shall be staggered.

2 Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.

3 Voids: Fill all voids, chipped corners, and other openings with insulating cement or material compatible with insulating material. In insulation with vapor barrier, coat with vapor barrier mastic.

4 Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

B Elastomeric Insulation:

1 Slit full length and snap around pipe.

2 Make cuts perpendicular to insulating surface leaving no cut section exposed.

3 Do not stretch insulation to cover joints or fittings.

4 Seal joints with adhesive. Sealing joints with tape will not be allowed.

5 Exterior insulation shall be painted with two coats of specified paint in accordance with the manufacturer’s instructions or encase in metal jacket.

C Fittings: Insulation specified with continuous vapor barrier; the vapor barrier must not be violated.

1 On Elastomeric and Acoustical Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.

2 In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

D Unions, Flanges, Mechanical Joints, Valves, Etc.:

1 General:

a As specified for fittings.

b Minimum thickness same as specified for piping.

2 Unions: Build up insulation at least 1/2 inch beyond adjoining insulation.

3 Flanges: Insulation with square corners.

4 Flanged Valves: Insulation with square corners.

E Vapor Barrier Insulation:

1 Piping which requires vapor barrier protection shall have a continuous vapor barrier, which shall not be pierced or broken. The following piping systems require vapor barrier protection:

a Refrigerant suction.

2 Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hanger, with shield at each hanger.

3 For all piping, vapor barrier shall be protected with pipe shield.

3.04 DUCT INSULATION APPLIED LOCATIONS

A Low Pressure Supply Ductwork:

1 Externally insulate line all low-pressure supply ductwork, 1-inch thick.

2 Flex duct: Factory insulated.

B Return Air Ductwork/Plenums: externally insulated throughout, 1-inch thick.

C Outside Air Ductwork: Externally insulated 2-inch-thick.

3.05 DUCTWORK INSTALLATION

A General:

1 Install in accordance with the manufacturer’s instructions.

2 The vapor barrier shall be continuous. Tears, holes, staples, etc. shall be coated with vapor barrier mastic and patched with facing or tape. Joints between insulation and access shall be provided with vapor barrier mastic.

3 Insulation at access panels shall be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B External Blanket Insulation:

1 Secure insulation to ductwork with 20-gauge snap wires 24 inches on center and at all joints.

2 Lap joints and seams a minimum of 3 inches and sealed with jacket tape.

C Board Insulation:

1 Space rectangular ducts with weld pins a maximum of 18 inches on center in both directions.

2 All corners shall be made with joints; bending insulation around corners will not be allowed.

3 All joints and seams shall be butted tight together.

4 Butt joints with 3-inch-wide tape.

5 Finish corners with 3-inch-wide tape.

D Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep and finish edges to maintain vapor barrier and to prevent damage to the insulation.

3.06 FIELD QUALITY CONTROL

A Field Test: All systems shall be tested and approved prior to installation of insulation.

B Existing Insulation:

1 Repair existing insulation damaged during construction.

2 Make neat connections where new and existing insulation meet.

3 Where existing piping, ductwork, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

23 0900

INSTRUMENTATION AND CONTROLS FOR HVAC SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A Furnish and install a stand-alone system for all mechanical systems. The system shall perform all sequences of operations stated within these specifications or shown on the drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 23 0500, Common Work Results for HVAC

B Section 23 0593, Testing, Adjusting, and Balancing

1.03 REFERENCES

A ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

1 ASHRAE Chapter 62: Ventilation for Acceptable Indoor

B FCC: Federal Communications Commission

1 FCC Part 15: Radio Frequency Devices

C ISO: International Organization for Standardization

1 ISO 9001: Quality Management Systems - Requirements

D NEC: National Electric Code

E NEMA: National Electrical Manufacturers' Association

F REA: Rural Electrification Administration

1 REA PE-60d: RUS Specification for Trunk Carrier Systems

G UL: Underwriters Laboratories

H US EPA: US Environmental Protection Agency

1 Energy Star Building Recommendations

1.04 SUBMITTALS

A For systems, equipment, and components specified herein, submit product/material data; certified shop drawings; installation, startup, and testing manuals; operation and maintenance data; operation and maintenance manuals; and as-constructed drawings.

1 Equipment Data: Include complete data for all materials, including field and system equipment. Data provided shall be marked to indicate which specific model or feature will be provided.

2 Operation and Maintenance Manuals: Manuals shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of nearest service representatives for each item of equipment and each system. Final copies delivered after completion of the acceptance tests shall include all modifications made during installation, checkout, and acceptance. Operation and maintenance manuals shall include the hardware manual, software manual, operations manual and maintenance manual.

1.05 QUALITY ASSURANCE

A FCC Regulation:

1 All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference, and be so labeled.

B UL:

1 Components shall be UL listed or recognized under the appropriate standard. These standards may include:

a UL 916 for energy management systems.

b UL 873 for controllers and temperature indicating and regulating equipment.

1.06 TRAINING

A Training:

1 General: Conduct training courses for designated personnel in operation and maintenance of system. Orient training to specific system being installed. Provide training manuals for each trainee, with two additional copies provided for archival at work site. Manuals shall include detailed description of the subject matter for each lesson.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A Controls and Power Wiring:

1 General: Electric equipment and wiring shall be in accordance with Division 26. Manual or automatic control and protective or signal devices required for operation specified, and any control wiring required for controls and devices, shall be provided hereunder. Run all control wiring in conduit.

2 Wiring: Field and Subfield Panels: Voltage in panels shall not exceed 120 volts. Where devices are wired to higher voltages, mount in suitable individual enclosures or group in separate control panel. Coordinate electrical power supply with Division 26, Electrical. Provide conduit and wiring required to spare breakers in accordance with Division 26, Electrical.

2.02 CONTROL DEVICES

A Low voltage heat only thermostat

1 Temperature range: 40 to 90 degrees F.

2 Power requirements: 24 to 30 VDC.

3 Electrical Connections: Screw terminal block.

4 Manufacturer: Honeywell TH1100DH or equivalent.

B Duct mount thermostat/sensor

1 Duct mounted thermostat with duct probe.

2 Temperature Range: 50 degrees F to 90 degrees F.

3 Analog 0 to 10 VDC Output: 0 to 10 VDC into 2KΩ Resistance Minimum 5 mA max at 10 VDC

4 Duct sensor: Indeeco 1016942 or equivalent.

5 Power requirements: 24 VAC, -15 percent, plus 10 percent, 50/60 Hz.

6 Manufacturer: Indeeco C1025 or equivalent.

C CO and NO2 sensor/transmitter

1 Electrical: Power supply 24 VAC/VDC plus/minus 20 percent, polarity protected, power consumption 250 mA (5 VA), max., toxic gases & oxygen 1 mA (0.1 VA), max. per sensor, alarm relays Two (2), 30 VAC/VDC, 0.5 A, potential-free, contacts (SPDT); 1 alarm & 1 fault/alarm.

2 Analog input signal: One (1), 4-20 mA overload and short-circuit proof, input resistance 200 Ω.

3 Analog output signal: One (1), proportional, overload and short-circuit proof, load ≤ 500 Ω, 4-20 mA = measuring range; 3.0 < 4 mA = under range; > 20-21.2 mA = over range; 2.0 mA = fault. Output for local bus 5 VDC, 250 mA max. Overload, short-circuit and polarity protected output signal for serial communication digital, RS-485, proprietary DGC6 protocol, 19200 baud

4 Sensors: 0-250 ppm CO sensor, 0-20 ppm NO2 sensor.

5 Horn & Status LED: Configurable by local thresholds. Horn - acoustic pressure > 85 dB (A), frequency 2300 Hz.

6 Protection class: NEMA 4X (IP65)

7 Status LED and LCD display: LCD Two lines, 16 characters each, illuminated.

8 Manufacturer: Intec Controls SGC6-00-CO-NO2 or equivalent.

D VRF controls

1 Integrated control system packaged with the outdoor heat recovery unit, distribution boxes and indoor units.

2 Wall Sensors:

a Fan speed adjustment.

b On/Off – Operation.

c Single setpoint.

3 Remote controller:

a Up to 64 groups of indoor units (128 units) can be connected.

b ON/OFF control.

c Temperature setting and monitoring.

PART 3 INSTALLATION

3.01 GENERAL

A Electrical:

1 Provide control wiring for all control devices and control panels.

2 Provide power wiring for all control devices and control panels. Obtain power from spare circuits in emergency power panels.

3 All wiring, including low voltage wiring, shall be installed in minimum 3/4-inch conduit in locations susceptible to damage. Plenum rated cable shall be used in other locations.

4 Grounding: Instrumentation and communication grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

5 Control voltage shall be limited to a maximum of 120 volts.

6 Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit shall be properly fused with fuse block located in respective starter enclosure.

7 Where relays are used to control single phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.

B Room Sensors: Mount at height of 4 feet for wall-mounted sensor and thermostats with adjustment on face. Provide one sensor for each zone of temperature control.

C CO/NO2 Sensors:

1 Mount at 3 feet above finished floor, or as shown on the drawings.

2 Provide quantity as required by coverage rating, or as shown on the drawings.

END OF SECTION

23 3113

LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes low pressure structural ductwork, single wall housing plenums, flexible ducts, and exposed ductwork for typical building HVAC applications.

1.02 REFERENCES

A NFPA: National Fire Protection Association

1 NFPA 13: Standard for the Installation of Sprinkler Systems

2 NFPA 90A: Standard for the Installation of Air-Conditioning and Ventilating Systems

B SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

1 SMACNA HVAC Duct Construction Standards - Metal and Flexible

1.03 QUALITY ASSURANCE

A Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the SMACNA HVAC Duct Construction Standards and these specifications.

B Regulatory Requirements:

1 Sheet Metal Ductwork, Single Wall Housing Plenums, Flexible Ducts, and Exposed Ductwork:

a Entire ductwork system, including materials and installation, shall be installed in accordance with NFPA 90A.

b Ductwork and components shall be listed as UL 181, Class I air duct; flame rating shall not exceed 25 and smoke rating shall not exceed 50.

C For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

1 Sheet Metal Ductwork: Provide schedule of duct construction standards.

2 Single Wall Housing Plenums: Provide shop drawings showing materials and construction details.

PART 2 PRODUCTS

2.01 HANGERS, SUPPORTS, ANCHORAGE, SEISMIC RESTRAINTS, AND SEISMIC CONTROL

A Provide hangers, supports, anchorage, seismic restraints, and seismic control for products specified herein in accordance with the requirements of the contract documents and SMACNA "HVAC Duct Construction Standards."

2.02 SHEET METAL DUCTWORK

A Fabricate from galvanized steel, unless noted otherwise on the drawings.

B Minimum gauge, duct construction, joint reinforcing, and fittings shall be in accordance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible."

C Duct Classification: Ducts shall be considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inch W.G., positive or negative.

1 The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch W.G., positive or negative.

a Supply ductwork downstream from terminal units.

b Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch W.G.

c Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.

2 The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch W.G. positive or negative.

a Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch W.G. On supply fans, pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.

b Supply, return, or exhaust ductwork serving multiple duct branches where the Contractor can demonstrate that pressures will not exceed 1-inch W.G., positive or negative.

3 The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inch W.G., positive or negative.

a Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1-inch W.G., positive or negative.

D Longitudinal seams on rectangular duct shall be Pittsburgh or Button punch snap lock, or equal. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch W.G. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch W.G. or less.

E Joining and reinforcing systems manufactured by Ductmate, Roloc, TDC, or equal, are acceptable. Ductmate 35 is equivalent to SMACNA “J,” and Ductmate 25 is equivalent to SMACNA “F.”

F Do not use adjustable round elbows.

2.03 FLEXIBLE DUCTS

A Acceptable Manufacturers: Thermaflex M-KE, Gen Flex IMP-25S, or equal.

B Description: Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch-thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket. Duct shall be rated for 6-inch W.G. positive and 1-inch W.G. negative.

PART 3 EXECUTION

3.01 APPLIED LOCATIONS

A HVAC Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 6 feet – 0-inch length.

B All HVAC Ductwork – Galvanized Sheet Metal

3.02 INSTALLATION

A Sheet Metal Ductwork:

1 Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system

2 Hang, support, restrain, and control movement and vibration of low-pressure ductwork systems, equipment, and components in accordance with the requirements of the contract documents and SMACNA “HVAC Duct Construction Standards - Metal and Flexible.” Do not use wire supports.

3 Provide supplementary steel for support of ductwork in shafts and between building structural members.

4 Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius shall have splitter vanes.

5 Change in duct size or shape necessitated by interference shall be made using rectangular equivalents of equal velocity.

B Dampers: Install where shown and where required. Install regulators as specified. Leave all dampers locked wide open.

C Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork. Not required on internally isolated spring units.

D Spin-In Fittings:

1 Install at branch take-offs to outlets using round or flex duct.

2 Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.

3 Leave all dampers locked wide open.

E Flexible Ducts:

1 Make connections at ends using draw band strap and a minimum of two wraps of duct tape.

2 Suspend center spans from structure above using galvanized steel straps or fire-resistant fabric straps as required by code. Use 1-inch wide (minimum) galvanized steel straps (or fire-resistant fabric straps) with single loop at top and smooth edges.

3 Do not lay flexible duct on the ceiling.

4 Avoid crimping flex duct. Make all changes in direction using 2D radius. Duct connections to grilles, registers and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows.

5 Maximum flexible duct length shall be 6 feet.

3.03 TESTING

A Check out, start up, and test systems, equipment, and components specified herein.

B Coordinate with Balancing Agency:

1 Provide the services of a sheet metal firm familiar with the system ductwork to assist the balancing agency during the initial phases of air balancing in locating all sheet metal dampers.

2 Install missing dampers.

END OF SECTION

23 3300

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes medium and low-pressure HVAC duct accessories, sealants and tapes, flexible connectors, combination fire/smoke dampers, access doors, spin-in fittings, extractors, drain pans, back draft dampers, and airflow measuring stations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 23 0719, HVAC Insulation

B Section 23 0900, Instrumentation and Controls of HVAC Systems

C Section 23 3113, Low Pressure Ductwork

1.03 REFERENCES

A NFPA: National Fire Protection Association

1 NFPA 90A: Standard for the Installation of Air-Conditioning and Ventilating Systems

B SMACNA: Sheet Metal and Air Conditioning Contractors' National Association, Inc.

1 SMACNA HVAC Duct Construction Standards - Metal and Flexible

1.04 SUBMITTALS

A For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

1 Include the manufacturer’s installation instructions.

1.05 QUALITY ASSURANCE

A Work shall be performed by qualified, experienced mechanics in accordance with SMACNA and these specifications.

B Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.

C Flexible connectors, flexible equipment connections, tapes and sealants shall be listed as UL 181, Class I air duct; flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50.

PART 2 PRODUCTS

2.01 LOW-PRESSURE HVAC DUCT ACCESSORIES

A Acceptable Manufacturers: As indicated, or equal.

B Damper Regulators:

1 Ventlok model numbers used; similar products by Young or Durodyne are acceptable.

2 2. Dial Regulator: Concealed or exposed duct in unfinished spaces, blade lengths 18-inch and less, 3/8-inch, Ventlock 635 or 638 for insulated duct. For blade lengths 19 inches and more, similar except 1/2-inch shafts.

3 Dial Regulator: Exposed duct finished space, 3/8-inch, Ventlock 640.

4 Dial Regulator: Concealed, not accessible, blade lengths 18-inch and less, 3/8-inch Ventlock 666 regulator with 680 mitered gear assembly where right angle turn is necessary. Blade lengths 19 inches and more, similar except 1/2-inch shafts.

5 End Bearings: For ducts rated to 1-inch W.G., open end, Ventlock 607. For ducts rated above 1-inch W.G., closed end, Ventlock 609. Exposed ductwork, finished spaces, Ventlock 609. Spring end bearings will not be allowed.

C Volume Damper Fabrication:

1 Single blade dampers shall be reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12 inches high shall use multiple opposed blade damper. Single blade damper shall be no larger than 12 inches by 48 inches. Multiple blade damper factory fabricated, Ruskin MD-35.

2 Construct minimum gauge and duct in accordance with SMACNA “HVAC Duct Construction Standards - Metal and Flexible.”

3 Splitter and butterfly dampers shall be fabricated of 18-gauge galvanized steel.

4 Dampers shall be of length suitable to close branch ducts without damper flutter.

5 Damper blade shall be aligned with handle and index pointer.

D Flexible Equipment Connections: 30 oz. Ventfabrics Ventglas or Duro Dyne Durolon neoprene coated fire-retardant glass fabric.

E Extractors (EX): Gang operated blades, steel construction, blades at 1-inch centers, slide operator set 15 degrees into main trunk duct. Titus AG-45 with No. 1 operator; Carnes; Anemostat; Barber-Coleman; Nailor-Hart.

F Spin-In Fittings:

1 Sheet Metal Duct: Straight pattern sheet metal spin-in fitting designed for connection to sheet metal ductwork, volume damper, and locking quadrant. Construct with spot welds or rivets. Button-punch fabrication prohibited.

2 Fiberglass Duct: Straight pattern sheet metal spin-in fitting designed for connection to fiberglass ductwork volume damper and locking quadrant. Construct with spot welds or rivets. Button-punch fabrication prohibited.

G Duct Sealer: United; Duro Dyne, S-2; 3M, EC900; Atlas, Multi-Purpose.

H Duct Tape for Sheet Metal: ARNO, C520; United; Duro Dyne; Nashua.

I Tape and Adhesive/Activator System for Sheet Metal: Hardcast.

J Turning Vane Assemblies:

1 Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4 1/2-inch (large vane) inside radius, galvanized steel construction.

2 Runners: Push-on type.

3 Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn.

K Access Doors:

1 Acceptable Manufacturers: Air Balance; Ruskin; Metco; Durodyne; Cesco; Nailor-Hart.

2 Doors shall be complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch by 14-inch and larger), hinge and gasketing. Doors on insulated or lined ducts shall be insulated.

3 Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8 inches	6 inches x 6 inches
9 inches to 12 inches	8 inches x 8 inches
13 inches to 20 inches	12 inches x 12 inches
21 inches to 30 inches	16 inches x 14 inches
31 inches to 42 inches	18 inches x 14 inches
Over 42 inches	Two 16 inches x 14 inches

L Backdraft Dampers:

1 Acceptable Manufacturers: Air Balance; Ruskin; Cesco; Advanced Air; Nailor-Hart.

2 Description: Gravity operated, vinyl edged, metal blade backdraft dampers.

M Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils.

N Louver Blank-Off Panels: At air intake or exhaust louvers which are only partially active area, blank off inactive area with sheet metal closure panels caulked airtight, secured to louver frame and insulated with 2-inch rigid fiberglass insulation in accordance with Section 23 0719, HVAC Insulation.

PART 3 EXECUTION

3.01 INSTALLATION

A Install all devices in accordance with the manufacturer's recommendations.

B Install low pressure duct accessories in accordance with Section 23 3113, Low-Pressure Ductwork.

C Access Doors: Install where indicated and at all automatic control dampers, fire dampers, and air flow stations to provide access for cleaning and maintenance.

D Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.

E Automatic Dampers: Install in accordance with Section 23 0900, Instrumentation and Controls of HVAC Systems. Coordinate damper operators with Section 23 0900, Instrumentation and Controls of HVAC Systems.

F Louver Blank-Off Panels: Install blank-off panels on unused portions of louvers.

3.02 TESTING

A Check out, start up, and test systems, equipment, and components specified herein.

END OF SECTION

23 3400

HVAC FANS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes centrifugal fans, in-line centrifugal fans, roof exhaust fans, plug fans, roof vents, small cabinet fans, propeller fans, and pressure blowers.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 23 0500, Common Work Results for HVAC

B Section 23 0529, Hangers and Supports for HVAC Piping and Equipment

C Section 23 0553, Identification for HVAC Piping and Equipment

D Section 23 0593, Testing, Adjusting, and Balancing

E Section 23 0900, Instrumentation and Controls for HVAC Systems

F Section 23 3300, Air Duct Accessories

1.03 REFERENCES

A AFBMA: Anti-Friction Bearing Manufacturers Association

1.04 SUBMITTALS

A For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

1 Shop Drawings: Include dimensions and details of construction.

2 Product Data: Include performance of fans.

3 Provide certified sound power ratings for each fan.

B For systems, equipment, and components specified herein, submit commissioning plans and schedules; checkout, startup, operational, functional, and final acceptance test plans, procedures, checklists, and reports; and operation and maintenance training plans.

PART 2 PRODUCTS

2.01 CENTRIFUGAL FANS

A Acceptable Manufacturers: Pace, Trane, Barry, Twin City, Peerless, Aerovent, Acme, Greenheck, Cook, or pre-bid approved equal.

B Description: Centrifugal or utility type centrifugal fans as indicated, standard factory finish, AMCA rated.

C Fans:

1 Single width, single inlet, double width, double inlet, forward curved, backward inclined, or air foil blades as scheduled.

2 Welded steel housing with sloped cut-off plates, spun steel or die formed inlet cone, and welded steel supports.

3 Statically and dynamically balanced within its own bearings with a maximum full amplitude shaft deflection at bearings not to exceed 0.001 inch at 1200 rpm, grease packed pillow block sealed bearings with not less than two pillow blocks per fan assembly. L-10 bearing life of 80,000 hours minimum in accordance with AFBMA standards.

D Motor: Integrally mounted, 1800 rpm maximum, with pre-lubricated sealed ball bearings. See Section 23 0500, Common Work Results for HVAC, for further motor requirements.

E Drive: Sized for 150 percent of motor horsepower, cast iron adjustable sheaves, V-belt type, sheaves statically and dynamically balanced, multiple belt drives on units over 2 horsepower. Metal guard over drive, OSHA approved. Provide fixed sheaves on units over 5 horsepower. Replace fan sheaves as necessary to obtain desired results. Include allowance for one sheave change for fans with fixed sheaves.

F Provide vibration isolation as specified.

G Provide fully welded scroll and scroll drains on fans subject to moist air streams.

H Fans exposed to weather shall have heavy gauge protective covers over bearings and shaft assembly.

I Provide fan outlets with removable angles and bolts for attaching flexible connections or discharge dampers.

J Sound power level (re: 10-12 watts) at fan inlet and discharge when producing CFM at static pressure shall not exceed the following in any octave band:

FAN	Octave Band Center Frequency (HZ)							
ID	63	125	250	500	1000	2000	4000	8000

2.02 CEILING MOUNTED CENTRIFUGAL FANS

A Acceptable Manufacturers: Greenheck BSQ, Penn, Cook, Acme, Carnes, or pre-bid approved equal.

B Description: Provide energy efficient motor as specified.

PART 3 EXECUTION

3.01 FLEXIBLE CONNECTIONS

A Provide flexible connections on all inlet and discharge duct connections.

3.02 CENTRIFUGAL FANS

A Mount on isolator base on rails.

3.03 CEILING MOUNTED CENTRIFUGAL FANS

A Connect ductwork using flexible connections.

3.04 TESTING

A Check out, start up, and test the systems, equipment, and components specified herein.

END OF SECTION

23 3700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes ceiling diffusers and sidewall grilles.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 23 3113, Low Pressure Ductwork

B Section 23 0593, Testing, Adjusting, and Balancing

1.03 SUBMITTALS

A For equipment and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

1 Shop Drawings: Include dimensions and details of construction.

2 Product Data: Show performance data including installed location by room number, air volumes, outlet velocity, pressure drop, throw at applicable pattern deflection, and noise level.

B For equipment and components specified herein, submit commissioning plans and schedules; checkout, startup, operational, functional, and final acceptance test plans, procedures, checklists, and reports; and operation and maintenance training plans.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A Where only Titus figure numbers are listed, equivalent products by Barber Colman, Carnes, Krueger, Metal-aire, Nailor,or equal will be accepted.

B All such products shall be of one manufacturer.

2.02 PERFORMANCE

A Unit sizing shall be based on air being introduced at 20 degrees F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5 degrees F. Units shall be selected so as not to exceed the NC-30 curve.

2.03 DIFFUSERS AND GRILLES

A Ceiling Supply Diffuser: Provide louvered face diffuser with steel panel, nominal 24 by 24 face, square or rectangular neck size as indicated, discharge pattern as indicated, lay-in tee bar ceiling, with round white baked enamel finish. Titus PMC, Border Type 3, or equal.

B Ceiling Supply Diffuser: Same as above except surface-mounted, Titus PMC, Border Type 1, or equal.

C Wall Supply Grille: Adjustable double deflection grille, steel border, aluminum blades, horizontal front with vertical rear blades, 3/4-inch spacing, 1-1/4-inch border, gasketed around face flanges, with white baked enamel finish. Titus Model 300, or equal.

D Wall Return/Exhaust Grille: Steel, 45-degree fixed single deflection, horizontal blades, 3/4-inch spacing 1-1/4-inch border, gasketed around face flange, with white baked enamel finish. Titus model 350, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A Install diffusers tight to their respective mounting surfaces.

B Install plumb and true with room dimensions and accurately centered on projections.

C Install extractors behind duct-mounted sidewall supply grilles. Turning vanes will be allowed if condition is the last outlet on a branch.

D Set pattern control for directions of throw prior to air balancer arriving on project.

E Paint ductwork behind outlets flat black.

3.02 COMMISSIONING

A Commission the equipment and components specified herein.

3.03 TESTING

A Check out, start up, and test the equipment and components specified herein.

END OF SECTION

23 8100

DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes rooftop-mounted packaged air-conditioning units, condensing units, and fan-coil units.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 23 0500, Common Work Results for HVAC

B Section 23 0529, Hangers and Supports for HVAC Piping and Equipment

C Section 23 0553, Identification for HVAC Piping and Equipment

D Section 23 0593, Testing, Adjusting, and Balancing

E Section 23 0719, HVAC Insulation

F Section 23 0900, Instrumentation and Controls for HVAC System

G Section 23 3400, HVAC Fans

1.03 REFERENCES

A NEC: National Electrical Code

1.04 SUBMITTALS

A For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

1 Shop Drawings: Include details of construction, dimensions, arrangement of components, isolation, filters, etc.

2 Product Data: Show performance data, standard items and accessories, and operating weight.

PART 2 PRODUCTS

2.01 SPLIT-SYSTEM AIR-COOLED VRF HEAT PUMP UNIT AND AIR HANLING UNIT

A Air-Cooled VRF Heat Recovery Unit:

1 Acceptable Manufacturers: ~~LG~~ Lennox, Carrier/Toshiba, Mitsubishi/Trane, Daikin, or equal.

2 Heat recovery unit to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

3 Description: Provide air-cooled heat pump unit(s) with heat recovery designed for outdoor installation with factory supplied supports, properly assembled, and tested at the factory. Unit shall be completely weatherproofed and include compressor, condenser coils, condensing fans, motor, refrigerant reservoir, charging valve, all controls, and a holding charge of R-410a. Provide guards on condenser fans and coil guard.

4 Compressors: Furnish hermetically sealed type with isolation and sound muffling. Each outdoor unit module shall be equipped with two or three inverter-driven twin rotary compressors with full range control. Motor shall be suitable for operation in an R-410A

refrigerant atmosphere. Compressor assembly shall be installed on rubber vibration isolators. Compressors shall be equipped with factory mounted crankcase heaters. Multiple compressors shall be manifolded for single joint connection on liquid and suction lines.

5 Condenser Coil: Non-ferrous construction consisting of aluminum plate fins mechanically bonded to seamless copper tubes and circuited for subcooling. Condenser coil shall have coil protection screens on to prevent coil damage.

6 Condenser Fans and Motors: Direct-driven propeller type fans with permanently lubricated motors.

7 Sizing: Select units for actual refrigerating capacities at coil including line losses.

8 Controls: Provide high- and low-pressure cutouts, contactors, and internal overload protection on all motors. Provide low ambient operation to 20 degrees F outside to maintain condensing temperature on part load operation. Provide short cycle timer.

9 Supports: Provide structural steel support. Submit for review before fabrication.

2.02 BRANCH SELECTOR UNITS

A Branch Selector Units: Concealed boxes designed specifically for this type of system to control heating/cooling mode selection of downstream units; consisting of electronic expansion valves, subcooling heat exchanger, refrigerant control piping and electronics to facilitate communications between unit and main processor and between branch unit and indoor/evaporator units.

1 Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.

2 Provide one electronic expansion valve for each downstream unit served, except multiple indoor/evaporator units may be connected, provided balancing joints are used in downstream piping and total capacity is within capacity range of the branch selector.

3 When branch unit is simultaneously heating and cooling, energize subcooling heat exchanger.

4 Casing: Galvanized steel sheet; with flame and heat resistant foamed polyethylene sound and thermal insulation.

5 Refrigerant Connections: Braze type.

6 Condensate Drainage: Provide unit that does not require condensate drainage.

7 Acceptable Manufacturers: ~~LG~~ Lennox, Carrier/Toshiba, Mitsubishi/Trane, Daikin, or equal.

8 Branch selector to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

2.03 INDOOR/EVAPORATOR UNITS

A All Indoor/Evaporator Units: Factory assembled and tested DX fan-coil units, with electronic proportional expansion valve, control circuit board, factory wiring and piping, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

1 Refrigerant: Refrigerant circuits factory-charged with dehydrated air, for field charging.

2 Temperature Control Mechanism: Return air thermistor and computerized Proportional-Integral-Derivative (PID) control of superheat.

3 Dehumidification Function: In conjunction with wall-mounted wired remote controller.

4 Coils: Direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.

a 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch.

b Flare connections to refrigerant piping.

c Provide thermistor on liquid and gas lines.

5 Fans: Direct-drive, with statically and dynamically balanced impellers; high and low speeds unless otherwise indicated; motor thermally protected.

6 Return Air Filter: Washable long-life net filter with mildew proof resin, unless otherwise indicated.

7 Where high efficiency filters are indicated, provide air filter rack.

8 Condensate Drainage: Built-in condensate drain pan with PVC drain connection.

a Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.

b Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.

9 Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

B Recessed Ceiling Units - 2 feet by 2 feet: Four-way airflow cassette with central return air grille, sized for installation in standard 24 by 24 inch lay-in ceiling grid.

1 Cabinet Height: Maximum of 12 inches above face of ceiling.

2 Exposed Housing: White, impact resistant, with washable decoration panel.

3 Maintenance Access: All electrical components accessible through decoration panel.

4 Supply Airflow Adjustment:

a Via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.

b Field-modifiable to 3-way and 2-way airflow.

c Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.

5 Sound Pressure: Measured at low speed at 5 feet below unit.

6 Fan: Direct-drive turbo type.

7 Condensate Pump: Built-in, with lift of 21 inches, minimum.

8 Provide side-mounted supply air branch duct connection.

9 Provide side-mounted fresh air intake duct connection.

10 Acceptable Manufacturers: ~~LG~~ Lennox, Carrier/Toshiba, Mitsubishi/Trane, Daikin, or equal.

C Wall Surface-Mounted Units: Finished white casing, with removable front grille; foamed polystyrene and polyethylene sound insulation; wall mounting plate; polystyrene condensate drain pan.

1 Airflow Control: Auto-swing louver that closes automatically when unit stops; five (5) steps of discharge angle, set using remote controller; upon restart, discharge angle defaulting to same angle as previous operation.

2 Sound Pressure Range: Measured at low speed at 3.3 feet below and away from unit.

3 Condensate Pump: Built-in, concealed.

4 Condensate Drain Connection: Back, with piping concealed in wall.

5 Fan: Direct-drive cross-flow type.

6 Fan Motor Output Range: From 0.054 to 0.058 HP.

7 Acceptable Manufacturers: ~~LG~~ Lennox, Carrier/Toshiba, Mitsubishi/Trane, Daikin, or equal.

D Air Handling Units: Factory-painted heavy gauge steel casing insulated with sound absorbing foil faced insulation.

1 Vertical Configuration: Top discharge air and bottom return air; floor mounted.

2 Horizontal Right Configuration: Horizontal discharge air and horizontal return air.

3 Secondary condensate drain pan; field installed.

4 Fan: Direct-drive ECM type fan with automatic airflow adjustment.

5 Provide air filter.

6 Electric Heating: Field installed, with circuit breaker for each unit.

7 External insulation; field installed.

8 Acceptable Manufacturers: ~~LG~~ Lennox, Carrier/Toshiba, Mitsubishi/Trane, Daikin, or equal.

9 Air handling units to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

PART 3 EXECUTION

3.01 SPLIT-SYSTEM, AIR-COOLED VRF HEAT PUMP UNIT AND AIR HANDLING UNIT

A Installation:

1 Install and level units and secure to structure.

2 Make piping connections. Provide minimum 2-inch trap seal on all condensation drain connections.

3 Provide interconnecting wiring from evaporator, condenser, and control panel. Provide interconnecting refrigerant piping between air handling unit and VRF heat pump unit. Size refrigerant piping between air handling unit and VRF heat pump unit in accordance with the manufacturer's instructions.

3.02 TESTING

A Check out, start up, and test systems, equipment, and components specified herein.

B Startup:

1 Comply with the manufacturer's instructions.

2 Install filters before operating unit.

3 Ensure proper water and air flow before operating unit compressor.

C Testing and Adjusting/Performance Test: Except where initial unit operation clearly shows the performance meets or exceeds the requirements, test to show compliance. Tests shall be performed by the manufacturer's representative in the presence of the Port.

END OF SECTION

26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A Drawings and general provisions of the contract, including general and supplementary conditions and Division 01, General Requirements specification sections, apply to this section.

1.02 SUMMARY

A This Section includes the following:

1 Procedural requirements.

2 Specifications for general items not specifically covered in other technical sections.

1.03 REFERENCES

A All equipment and materials shall be installed in accordance with the applicable standards of the following organizations:

1 ANSI: American National Standards Institute

2 IBC: International Building Code

3 ICEA: Insulated Cable Engineers Association

4 IEEE: Institute of Electrical and Electronic Engineers

5 NEC: National Electrical Code

6 NEMA: National Electrical Manufacturers Association

7 NFPA: National Fire Protection Association

8 OSHA: Occupational Safety and Health Administration

9 UL: Underwriters Laboratories

1.04 CODES, PERMITS, AND CERTIFICATES

A See Division 1 for specific requirements relating to codes enforced, permits, and inspections.

B Provide notification 48 hours prior to covering concealed electrical work to allow inspection.

C In preparation for final inspection, all electrical equipment shall have wires installed and under terminal posts, and circuit schedule and labeling complete.

D Deliver certificates from inspection authorities, certifying work is complete and satisfactory, before acceptance of the work.

1.05 DELIVERY, STORAGE, AND HANDLING

A Store and handle materials to protect against corrosion or mechanical damage. Remove damaged materials from site immediately after detection.

B Deliver materials in manufacturer’s packaging. Deliver conductors and cables in complete coils.

1.06 ELECTRICAL DRAWINGS

A The drawings are diagrammatic and do not show every detail of installation

PART 2 PRODUCTS

2.01 MATERIALS

A Supply all materials to complete and provide the operating system specified, unless it is specifically indicated that materials are being furnished by others, or that existing equipment shall or may be reused.

B All materials shall be new and meet the requirements of these specifications.

C All components and equipment provided and normally tested and labeled by Underwriters Laboratories (UL), or similar recognized third-party approval authority, shall be so labeled.

2.02 GENERAL SUPPORT AND ANCHORING HARDWARE

A All anchors, nuts, washers, and bolts shall be rust resistant, plated type, unless specified otherwise. Anchors, nuts, washers, and bolts for exterior use shall be stainless steel.

B Brackets and miscellaneous hardware shall be rust resistant, plated type, unless specified otherwise.

C Exterior channel-type support or where noted on drawings shall be hot-dipped galvanized. Interior channel-type support shall be hot-dipped galvanized or electro-galvanized plus zinc chromate finish. Kindorf, Superstrut, Unistrut, or equal.

D Clamps, brackets, and similar hardware utilized with the channel support system shall be of the same manufacturer and be similarly galvanized.

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

A Layout of the various equipment is very specific with the dimensioning, relative location and/or dimensions shown on the drawings. Call attention to any error, conflict, or discrepancy in the drawings or specifications. Do not proceed with any questionable items of work until clarification has been received.

B Work under this division shall be conducted in a cooperative manner with work of other divisions employed on the project, for proper installation of all items of equipment.

C Verify he physical dimensions of each item of electrical equipment to fit the available space and provide prompt notification prior to roughing in if conflicts appear. Coordinate equipment to fit into the available spaces and coordinate access routes through the construction site.

3.02 PRTOTECTION

A Electrical work, wire and cable, materials, and other equipment specified in this division shall be protected against damage by other construction activities, weather conditions, or any other causes as a part of this work. Equipment found damaged or in other than new condition shall be rejected as defective.

B Light fixtures and electrical equipment shall be kept covered or closed to exclude moisture, dust, dirt, cement, or paint and shall be free of all contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches, or other finish defects. Properly refinish to new condition if damaged.

C Conduit and raceways shall be kept closed during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Raceways shall be clean and dry before installation of wire and shall be so at the time of acceptance.

3.03 GENERAL INSTALLATION METHODS

A All material and equipment shall be installed in accordance with the manufacturer's recommendations, instructions, and/or installation drawings, and in accordance with NEC and specifications.

B Unless otherwise noted on the drawings, conceal all wiring in finished spaces. Exposed conduit is acceptable only when and where prior specific authorization is obtained from the architect. If exposed conduit is installed, it shall be parallel to structural lines.

C Unless otherwise noted on the drawings, all wiring devices, recessed light fixtures, etc., in finished spaces shall be flush-mounted.

D Provide necessary rigid conduit sleeves, openings, and chases where conduits or cables are required to pass through floors, ceilings, or walls. Seal all openings around conduits against leaks and in a manner to maintain the fire rating of the structure penetrated. Prevent unnecessary cutting in connection with the finished work.

E Cutting or notching shall be kept to a minimum. Structural members shall not be disturbed or cut in any way without specific written approval from the architect and engineer. Patch and correct finished surfaces damaged by electrical work.

F Provide all backing and mounting hardware required to complete the electrical systems in a safe, working condition as part of the contract work.

G Comply with code requirements and methods.

H In general, mounting heights shall be as noted on the drawings. Where no heights are indicated, request clarification. All device dimensions are to the center above finish floor unless specified otherwise. Lighting dimensions are to the bottom of suspended fixtures.

3.04 FIRESTOPPING

A Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.

3.05 EQUIPMENT CONNECTIONS

A For each electrical equipment connection indicated, provide incidental wiring, devices, labor, and all materials and accessories as needed to complete splices and terminations of the equipment.

B Verify the location and method for connecting to each item of equipment prior to roughing in. Check the voltage and phase of each item of equipment before connecting. Motor connections shall be made for the proper direction of rotation.

C Conduit, wire, and circuit breaker sizes for equipment furnished under other divisions are based on the equipment ratings of one manufacturer. The electrical characteristics of the equipment furnished may differ from the ratings of the specified equipment. The Contractor shall coordinate the electrical requirements of the equipment to be furnished with the equipment supplier prior to purchase or installation of conduit, wire, starts, and circuit protection required for equipment connection.

3.06 NOISE CONTROL

A Outlet boxes at opposite sides of partitions shall not be placed back to back, nor shall straight-through boxes be employed, except where specifically permitted on the drawings by note, to minimize transmission of noise between occupied spaces.

B Ballasts, contactors, starters, transformers and like equipment which are noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced at no additional cost to the contract.

3.07 GENERAL EQUIPMENT SUPPORT

A Each fastening device and support for electrical equipment, luminaires, panels, outlets and cabinets shall be capable of supporting no less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure and shall be installed to resist seismic forces as specified in the IBC for the ground motion accelerations corresponding to the project location.

B Properly and independently support luminaires installed under this work from the building structure. Supports shall provide proper alignment and leveling of luminaires. Where permitted, flexible connections to exposed luminaires shall be neat and straight, without excess slack, attached to the support device.

C Support all junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above or roof structure to prevent sagging or swaying.

D Conduits:

1 Support suspended conduits from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of 4.

3.08 TESTING

A Upon completion, systems shall be tested to show the equipment installed operates as designed and specified, free of faults and unintentional grounds.

B A journeyman electrician with required tools shall be available to conduct all tests, with or without the equipment factory representative present.

C Systems to be tested shall include, but not be limited to the following:

1 Low voltage distribution system.

2 Emergency lighting system.

3 Lighting system.

4 Lighting control system.

D A written record of performance tests shall be compiled, dated, witnessed, and submitted along with operating and maintenance data.

END OF SECTION

26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A Drawings and general provisions of the contract, including general and supplementary conditions and Division 01, General Requirements specification sections, apply to this section.

1.02 SUMMARY

A This Section includes the following:

1 Building wires and cables rated 600 V and less.

2 Connectors, splices, and terminations rated 600 V and less.

3 Sleeves and sleeve seals for cables.

1.03 SUBMITTALS

A Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B Comply with NFPA 70.

1.05 COORDINATION

A Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1 Essex Group, Inc.

2 Southwire Company.

B Copper Conductors: Comply with NEMA WC 70.

C Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.02 CONNECTORS AND SPLICES

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1 Ideal Industries.

B Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SLEEVE SEALS

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1 Advance Products & Systems, Inc.

2 Metraflex Co.

3 Pipeline Seal and Insulator, Inc.

C Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1 Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

2 Pressure Plates: Carbon steel. Include two for each sealing element.

3 Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

A Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway or MC Cable.

C Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or MC Cable.

D Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application.

F Class 1 Control Circuits: Type THHN-THWN, in raceway.

G Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.03 INSTALLATION OF CONDUCTORS

A 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.

B Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3.04 CONNECTIONS

A Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.

B Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

END OF SECTION

26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A Drawings and general provisions of the contract, including general and supplementary conditions and Division 01, General Requirements specification sections, apply to this section.

1.02 SUMMARY

A This Section includes methods and materials for grounding systems and equipment.

1.03 SUBMITTALS

A Product Data: For each type of product indicated.

B Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1.04 QUALITY ASSURANCE

A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 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 B 3.

2 Stranded Conductors: ASTM B 8.

3 Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

2.02 GROUND RODS

A Copperweld, 3/4-inch by 10-foot ground rods. Where ground wells are indicated, provide a 12-inch-deep, 8-inch diameter precast concrete well with flush lid for accessibility and inspection of welded connections. RCP Vaults No. 12R12A with 12R12 t cover, or equal.

2.03 CONNECTORS

A Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

C Pipe Connectors: Clamp type, sized for pipe.

D Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 EXECUTION

3.01 APPLICATIONS

A Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B Conductor Terminations and Connections:

1 Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2 Connections to Structural Steel: Welded connectors.

3.02 EQUIPMENT GROUNDING

A Install insulated equipment grounding conductors with all feeders and branch circuits.

B Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1 Feeders and branch circuits.

2 Lighting circuits.

3 Receptacle circuits.

4 Single-phase motor and appliance branch circuits.

5 Three-phase motor and appliance branch circuits.

C Provide grounding bushings on all feeder conduit entrances to panels and equipment enclosures and bond bushings to enclosures with minimum No. 10 AWG conductor. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through No. 10 AWG.

3.03 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 Grounding and Bonding for Piping:

1 Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.04 FIELD QUALITY CONTROL

A Perform the following tests and inspections and prepare test reports:

1 After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2 Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

3 Measure ground resistance not less 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.

4 Perform tests by fall-of-potential method according to IEEE 81.

B Report measured ground resistances that exceed the following values:

1 Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

C Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes supporting devices for electrical equipment, associated conduit, and cable.

1.02 REFERENCES

A IBC: International Building Code

1 IBC Chapter 16: Structural Design

B SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

1 SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems, for SHL

PART 2 PRODUCTS

2.01 PRODUCTS

A Hangers: Kindorf B 905 2A channel, H 119 D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or equal.

B Pipe Straps: Two-hole galvanized or malleable iron.

C Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1 Support brackets with cable tie slots for fastening cable ties to brackets.

2 Lacing bars, spools, J-hooks, and D-rings.

3 Straps and other devices.

PART 3 EXECUTION

3.01 INSTALLATION

A Provide all electrical equipment supports.

B Install vertical support members for equipment, straight and parallel to building walls.

C Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.

D Do not use other trades' fastening devices to support electrical equipment materials or fixtures.

E Do not use supports and/or fastening devices to support other than one item.

F Support conduits within 18 inches of outlets, boxes, panels, cabinets, and deflections.

G Provide complete seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 16 and the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems, for Seismic Hazard Level (SHL) A. Shop drawings of bracing systems shall be submitted for review and shall bear the seal of a professional engineer registered in the State of Oregon.

3.02 CABLES AND RACEWAY

A Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:

1 Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.

2 Raceways are not larger than one-inch trade size and cables and bundled cables are not larger than one-inch diameter including insulation.

3 Not more than three raceways or cables are supported by any independent support wire and are supported within the top or bottom 12 inches.

4 Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5 feet or per the manufacturer's installation instructions.

5 Raceways are secured at intervals required for the type of raceway installed.

6 Cables and raceway are secured to independent support wires by fastening devices and clips designed for the purpose.

7 Independent support wires are distinguishable by color, tagging, or other effective means.

B Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:

1 The size of the rods, channel, and fastening devices are suitable for the anticipated weight.

2 The spacing of the trapezes meets that required for the type of raceway installed.

3 Cables and raceway are secured to a trapeze by straps designed for the purpose.

4 Cables and raceway do not support other raceway or cables.

5 An appropriately sized seismic bracing system is installed.

END OF SECTION

26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes raceways, conduits, and boxes for electrical systems wiring, including all fittings, hangers, and appurtenances.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 26 0526, Grounding and Bonding for Electrical Systems

B Section 26 0536, Cable Trays for Electrical Systems

C Section 26 0543, Underground Ducts and Raceways for Electrical Systems

D Section 26 0553, Identification for Electrical Systems

E Section 26 2726, Wiring Devices

1.03 REFERENCES

A ANSI: American National Standards Institute:

1 ANSI C80.1: Electrical Rigid Steel Conduit

2 ANSI C80.3: Steel Electrical Metallic Tubing

3 ANSI C80.4: Fittings for Rigid Metal Conduit and Electrical Meta

B ASTM: American Society for Testing Materials:

1 ASTM A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

2 ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems

C JIC: Joint Industrial Council

1 JIC EMP-1: Electrical

D NEC: National Electrical Code:

E NEMA: National Electrical Manufacturers Association.

1 NEMA RN 1: Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

2 NEMA TC2: Electrical Polyvinyl Chloride (PVC) Tubing and Conduit

3 NEMA Product and Installation Standards.

F NFPA: National Fire Protection Association:

1 NFPA 70: National Electrical Code

G TIA: Telecommunications Industry Association/Electronic Industries Association

1 TIA 569-A: Commercial Building Standard for Telecommunications Pathways and Spaces

H UL: Underwriters Laboratories:

1 UL 360: Standard for Liquid-Tight Flexible Metal Conduit

2 UL 651: Rigid Nonmetallic Electrical Conduit

3 UL 651A: High-Density Polyethylene Conduit

4 UL 1479: Intermediate Metal Conduit.

1.04 DEFINITIONS

A "Where subject to physical damage," is defined as a surface installation within an 8-foot zone above a finished floor, in areas subject to vehicular traffic, including manually operated forklifts.

1.05 SUBMITTALS

A Submittals for the following materials shall consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized. Upon review of this list, further information may be requested.

1 Conduit.

2 Conduit fittings.

3 Supports.

B Submittals for the following materials shall be complete with detailed information and cut sheets.

1 Wireway and wire gutters.

C Provide as-constructed drawing information identifying final conduit routing and box locations upon completion of the work.

1.06 QUALITY ASSURANCE

A Products shall be new and certified by an approved testing laboratory.

PART 2 PRODUCTS

2.01 GENERAL

A Materials shall be of current standard design and shall conform to the established standards of an approved testing laboratory. Like items shall be of the same manufacturer and type.

B All circuiting that is #10 AWG or #12 AWG to be fed from MC cable with EMT for home runs. MC Cable to be used in place of pipe and wire.

2.02 METALLIC CONDUITS

A Galvanized Rigid Steel Conduit (GRSC):

1 Heavy wall construction, manufactured in conformance with ANSI C80.1 and listed as UL 6 approved.

B Electrical Metallic Tubing (EMT):

1 Thin wall electrogalvanized steel, manufactured in conformance with ANSI C80.3 and listed as UL 797 approved.

C PVC Coated Rigid Steel Conduit and Fittings:

1 ANSI C80.1 hot-dipped galvanized rigid steel conduit with an external 0.040-inch minimum PVC protective coating per NEMA Standard RN 1. Both ends of conduit shall be threaded with thread protectors, factory installed. Fittings shall be threaded type ANSI C80.4, hot-dipped galvanized, with a 0.055-inch minimum PVC protective coating. PVC coating on fittings shall match the coating on the PVC coated conduit.

D Flexible Metal Conduit:

1 Manufactured from hot dipped galvanized steel manufactured in conformance with UL standards. Flexible metal conduit shall be a minimum of 1/2 inch standard trade size.

E Liquid-Tight, Flexible Metal Conduit:

1 Conduit shall have a ground wire.

2 Aluminum or galvanized flexible metal conduit shall have a polyvinylchloride chemical resistant jacket in conformance with the requirements of UL 360. Acceptable manufacturers are Sealtight, or equal.

2.03 RIGID NON-METALLIC CONDUITS

A Polyvinylchloride (PVC) Conduit:

1 PVC conduit shall be Type II, in conformance with NEMA TC2 and the following:

a Schedule 40, high impact.

b Suitable for use with 90 degrees C rated wire.

c Conform to UL Standard 65l and carry appropriate UL listing for above and below ground use.

B High-Density Polyethylene (HDPE) Conduit:

1 HDPE conduit shall be the following:

a Schedule 40, high impact.

b Suitable for use with 90 degrees C rated wire.

c Conform to UL Standard 651A and have appropriate UL listing for below-ground use.

2.04 METALLIC BOXES

A Flush and Concealed Outlet Boxes:

1 Galvanized stamped steel with screw ears for device ring mounting, knock out plugs, mounting holes, and fixture studs if required. Acceptable manufacturers are RACO, or equal.

B Surface Outlet Boxes (Interior Locations):

1 Boxes for use on ceilings shall be galvanized stamped steel with screw ears for device ring mounting, knock out plugs, mounting holes, and fixture studs if required. Acceptable manufacturers are RACO, or equal.

2 Boxes for use on walls below 8 feet or where noted on drawings shall be cast steel or aluminum with threaded hubs.

C Large Boxes:

1 When required, boxes exceeding 4 11/16 inches square shall be welded steel construction with screw cover and painted, steel gauge matching physical size. Acceptable manufacturers are Hoffman, Circle AW, or equal.

D Floor Boxes:

1 Boxes in concrete floors shall be adjustable flush power floor boxes with aluminum duplex service tops. Acceptable manufacturers are Hubbell 825 29/SA 3925, or equal.

2 Boxes on flush ducts shall have service fittings as required. Equip outlets with receptacles as specified in Section 26 2726, Wiring Devices. Acceptable manufacturers are Hubbell SC 3900 series, or equal.

2.05 BOXES AND FITTINGS

A Sheet Metal Boxes and Fittings:

1 Boxes and fittings installed in areas where electrical metallic tubing is specified shall be standard UL-approved sheet steel type.

B Cast Ferrous Alloy Boxes (Outside Locations):

1 Hot-dipped galvanized cast ferrous alloy unless otherwise specified.

2 Conduit entrances shall be integrally cast threaded hubs or bosses and shall provide for full 5-threaded contact on tightening. Drilling and treading shall be done before galvanizing.

3 Device covers shall be suitable for boxes, with full-body neoprene gaskets to fit the devices and boxes used.

4 Cover plates shall be hot-dipped galvanized cast ferrous alloy unless the device requires a cover that is not manufactured in this material.

5 Type 304 stainless steel screws shall be provided for covers.

6 Where two or more devices are located together, outlet and device boxes shall be gang type.

7 Device boxes shall be FD boxes as manufactured by Crouse-Hinds, Appleton, or equal.

C Floor Boxes:

1 Hot-dipped galvanized cast boxes with a NEMA 4 rating.

2 Boxes shall have a recessed ring neoprene gasket, and checker plate covers.

3 Cover fasteners shall be 316 stainless steel machine screws of not less than 1/4-inch diameter. The cover screws shall be flathead socket-type recessed screws, countersunk below the level of the cover.

D Steel Sheet Boxes (Outside Locations):

1 Boxes larger than Type FD shall be fabricated from steel plating and shall be hot-dipped galvanized. The thickness of the steel plating shall conform to the requirements of JIC. Before finish galvanizing, furnish and install a grounding pad drilled for two-bolted grounding lugs or with a grounding stud welded to the inside of the box.

2 Provide 316 stainless steel hardware.

3 Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4 where exposed to weather or water.

4 Galvanized sheet steel boxes may be used in protected areas where electrical metallic tubing is specified. Boxes shall be a minimum of 4 inches square.

E Boxes and Fittings for Hazardous Locations:

1 In locations specified as Class I, Divisions 1 or 2, hazardous, boxes and fittings shall be NFPA No. 70, explosion-proof, in addition to the requirements specified above.

2 Seals for conduit systems shall be hot-dipped galvanized cast ferrous alloy, and each seal shall be of suitable configuration for the individual circumstance. Sealing compound shall be hard type, Chico A, or equal, and shall be UL listed for explosion-proof sealing fittings.

F Boxes and Fittings in Corrosive Locations:

1 Surface boxes and fittings located in areas specified as corrosive shall be NEMA 4X. Conduit entering plastic boxes and exposed metal on plastic boxes which are not isolated from the interior of the box shall be bonded together with a suitable grounding conductor.

2 Seals for entry in corrosive locations shall be oblong conduit bodies filled with soft non-setting compound.

G Terminal Cabinets:

1 Meet NEMA 12 and JIC requirements as a minimum, be made from sheet steel, and have hinged doors. Cabinets exposed to weather or moisture shall meet NEMA 4X requirements.

2 Except for those located in electrical equipment rooms, cabinets shall be finished inside and out with a powdered thermosetting resin system resistant to abrasion, moisture, acids, alkalis, high temperatures, and flame.

3 Exterior color shall be gray. Interior color shall be white.

4 Before finish is applied, a copper grounding pad for a two-bolt grounding lug or grounding stud shall be provided inside the cabinet.

5 Provide 316 stainless steel hardware.

6 Terminal cabinets shall have terminal blocks of size and capacity for the required loads and shall be rated 30 amperes, 600V AC minimum. Contacts shall be No. 8 minimum strap screw of a type suitable for ring tongue or locking spade terminals. Similar cabinet with a mounting panel shall be provided for mounting miscellaneous field equipment.

H Hubs:

1 Hubs for connection of conduit to junction, device, or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc, and shall have insulating bushings.

2 Hubs shall contain a neoprene O-ring and shall provide a watertight connection.

2.06 CONDUIT FITTINGS

A GRSC:

1 Fittings, including couplings, shall be threaded unless otherwise approved by the Port.

2 Threadless Couplings and Connectors:

a GRSC couplings and box connectors may be steel threadless, compression ring, or set screw type for use with conduits 1 inch and smaller installed in poured concrete locations where limited working space makes threaded fittings impractical.

b Threadless fittings are not acceptable for use with GRSC conduits except as allowed above. They may, however, be used with EMT type conduits.

3 Myers hubs or equal shall be used with NEMA 2, 3, 3R, 4 and 12 enclosures.

4 Threaded Locknuts:

a Sealing type may be used with NEMA 2, 3, 3R, 4 and 12 enclosures at bottom penetrations.

b Extra-heavy electrogalvanized steel for sizes up to 2 inches. Locknuts larger than 2 inches shall be electrogalvanized malleable iron.

5 Threaded Bushings:

a 1 1/4 inch and larger, insulated, grounding type as required in Section 26 0526, Grounding and Bonding for Electrical Systems.

b Electrogalvanized malleable iron with insulating collar.

c Locking type and provided with a feed-through compression lug for securing the ground cables.

6 Unions shall be electrogalvanized ferrous alloy type. Acceptable manufacturers are Appleton, UNF or UNY; Crouse-Hinds, UNF or UNY; or equal.

7 Conduit bodies shall be ferrous alloy type (malleable iron), with clamp type fastening covers.

8 Gaskets shall be neoprene.

B EMT:

1 EMT couplings and connectors shall be watertight compression type or set screw type with steel bodies, zinc or cadmium coated. Die cast fittings will not be permitted.

2 Connectors shall be steel compression ring or set screw type for conduit termination, with insulated throat, suitable for the application.

3 Couplings shall be steel compression ring or set screw type.

C Flexible Metal Conduit:

1 Fittings shall be 2-screw steel body type, zinc, or cadmium coated. Die cast fittings will not be permitted.

D Liquid-Tight, Flexible Metal Conduit:

1 Fittings for liquid-tight conduit shall have a cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule, threaded to engage conduit spiral and o-ring seals around the conduit and box connection and insulated throat. Use 45-degree and 90-degree fittings where necessary.

2 Fittings shall be threaded and compression type for polyvinyl jacketed flex.

E Weatherproof Connectors:

1 Provide threaded connectors.

F Expansion Couplings:

1 Provide O.Z. type EX couplings with jumper. Gedney, or equal.

G Seal Offs:

1 Provide seal-offs with filler fiber, compound, and removable cover.

H HDPE Conduit:

1 HDPE couplings and connectors shall be UL listed and specifically designed for HDPE applications.

2 HDPE connectors and joints shall be made by a method approved by the Port. PVC glue is not permitted on HDPE.

2.07 RACEWAY SUPPORTS

A Conduit Supports:

1 Hot-dipped galvanized (exterior) or electrogalvanized (interior) steel framing channel to support groups of conduits.

2 Use one-hole galvanized malleable iron pipe straps with galvanized clamp backs and nesting backs where required.

3 Use one-hole galvanized steel pipe straps on studs for interior applications.

4 Supports for PVC coated rigid steel shall be PVC coated straps, struts, or hangers.

B Ceiling Hangers:

1 Adjustable galvanized carbon steel rod hangers in conformance with ASTM A193. Rods shall be minimum 1/2 inch in diameter, threaded continuously.

2 Use stainless steel hanger rods where rods will be in corrosive areas and exposed to the effects of weather or moisture.

C Structural Attachments (Racks):

1 Hot-dipped galvanized steel framing channel.

2 Treat field cuts with zinc-enriched paint.

2.08 WIREWAYS

A Wireway and auxiliary gutters shall meet JIC, EMP-1 standards, shall be sectional flanged oil tight type with hinged covers, and shall be 8 inches in cross section unless otherwise specified.

B Troughs shall be painted steel, square in cross section, with screw covers. Use gasketed, weatherproof type for exterior applications.

C Fittings, tees, elbows, and couplings shall be as needed for configurations shown on the drawings.

2.09 MISCELLANEOUS PRODUCTS

A Provide watertight seals at penetrations though exterior walls or walls exposed to moisture. Acceptable manufacturers are type CSMC by O.Z. Gedney Co., Link Seal by Thunderline Corp., or equal.

B Provide waterproof firestops and seals in specified locations. Acceptable manufacturers are Flamemastic 71A, Vimasco No. 1-A, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A General:

1 Existing boxes and raceways, exposed under this contract, shall be properly supported per NEC before cover approval.

2 All conduit and wireway installations shall comply with NEMA, “Standards of Installation.”

3 Cutting or notching shall be kept to a minimum, using only approved methods. Structural members shall not be disturbed or cut in any way without specific written approval from the Port, on a case-by-case basis. Patch and correct finished surfaces damaged by electrical work. Fire barriers shall be returned to their original condition using materials of equal or higher fire rating and specifically designed for that use.

4 Unless otherwise noted on the drawings, all conduit work in finished spaces shall be concealed. Exposed conduit is acceptable only when and where prior specific authorization for use is obtained from the Port.

5 Conceal all conduits in finished spaces and elsewhere so far as practicable. Concealed conduits shall run in a direct line with long sweep bends and offsets. Where conduit runs between junction boxes and/or devices, route conduit vertically below ceiling level. Where horizontal runs are required, route above ceiling level for future flexibility.

6 Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces shall closely follow the surfaces. Conduit fittings may be used to “saddle” under beams.

7 Route conduit in existing racks whenever possible.

8 Cut conduits square, ream smooth, and draw fittings up tight with at least five threads fully engaged.

9 Conduits, whether exposed or concealed, shall be securely supported, and fastened at minimum intervals of 6 feet and within 18 inches of each outlet, elbow, fitting, panel, etc. Support suspended conduits with metal ring or trapeze hangers on threaded, steel rods having a safety factor of four.

10 During construction, keep conduit and raceways closed with suitable plugs or caps to prevent entrance of dirt, moisture, concrete, or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.

11 Pack spaces around conduits with oakum and seal to prevent entrance of moisture where conduits are installed in sleeves or block outs which penetrate moisture barriers.

12 Install intumescent material around ducts, conduits, etc. to prevent spread of smoke or fire where installed in sleeves or block outs which penetrate rated fire barriers. The penetration sealing system shall be capable of passing a 3-hour test per ASTM E814 (UL 1479) and shall consist of a material capable of expanding when exposed to temperatures of 250 - 350 degrees F. An alternate method utilizing intumescent materials in caulk and/or putty form may be used.

13 Provide GRSC on underground conduit runs at 60-degree and larger bends, and where conduits exit concrete.

14 Underground stub-ups shall use wrapped or PVC coated rigid steel galvanized 90-degree elbows with a minimum radius not less than that permitted by code, or as noted on the drawings. Conduit risers from these elbows shall be wrapped or PVC coated rigid steel galvanized conduit. Extend GRSC 18 inches beyond penetrations.

15 Existing raceways exposed under this contract shall be properly supported per NEC before cover approval.

B Conduit Runs Between Pull Boxes:

1 Limit the number of directional changes of the conduit to a maximum total of 270 degrees in any run between pull boxes.

2 Limit the number of directional changes of the conduit to a maximum of 180 degrees in any run between pull boxes for communications conduits, unless otherwise approved by the Port.

3 Limit conduit runs to 400 feet, less 100 feet for each 90 degrees of change in direction.

4 Avoid bends and offsets whenever possible. However, when bends and offsets are necessary, they shall be factory bends or bends made with a hickey or conduit bending machine. Heating, welding, or brazing the conduit for bends is not acceptable.

C Junction and Pull Boxes:

1 Where required for pulling cable and as necessary to meet NFPA No. 70, provide cast junction boxes or pull boxes. Pull boxes used for multiple conduit runs shall not combine circuits fed from different MCC's, switchboards, or switchgear.

D Conduit Terminations:

1 Conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating grounding or bonding bushing constructed over the conduit end.

2 Conduit entering top or sides of NEMA 3R, 4, and 12 boxes shall be terminated with a rain-tight hub having an insulated liner.

3 Surface-mounted cast boxes and plastic enclosures shall have threaded hubs.

4 Joints shall be made with standard couplings or specified unions.

5 Metal parts of plastic or coated control stations and coated boxes shall be bonded to the conduit system.

6 Running threads shall not be used in lieu of nipples, nor shall excessive thread be used on any conduit.

7 The ends of conduit shall be cut square, reamed, and threaded with straight threads.

8 Male threads on rigid steel conduit shall be coated with electrically conductive, zinc rich paint.

9 Steel conduit shall be made up-tight, with thread compound.

E Conduit Support:

1 Exposed metallic conduit shall be run on supports spaced not more than 6 feet apart unless noted otherwise on the drawings and shall be constructed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceiling.

2 Exposed PVC conduit shall be run on supports spaced not more than 3 feet apart for conduits up to 1 inch, 5 feet apart for conduits 1 1/4 inches to 2 inches, and 6 feet apart for conduits 2 1/2 inches and larger.

3 No conduit shall approach closer than 6 inches to any object which operates above the rated temperature of the cable insulation it contains.

4 Conduit, except PVC, supported directly from the concrete structure shall be spaced at least 1/4 inch using one-hole, hot-dipped galvanized, malleable iron straps with nesting backs or, if three or more conduits are in parallel run, they may be spaced from the wall approximately 5/8 inch to 1 inch by means of framing channel.

5 Runs of individual conduit suspended from the ceiling shall be supported with galvanized carbon steel rod hangers. Where three or more conduits are suspended from the ceiling, steel racks shall be constructed.

6 PVC conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using PVC conduit wall hangers.

7 Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors, die-cast rust-proof expansion shields, or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts are not acceptable as a base to secure conduit supports.

F Conduit Penetrations:

1 Conduit routed through floors, walls, or other concrete structures shall pass through cast-in-place openings wherever possible. In cases where cast-in-place openings are not possible, use appropriately sized holes which will not impair the structure's integrity. After completion, grout, and caulk surface to be watertight and refinish to match existing surroundings.

2 Install watertight seals wherever conduits penetrate concrete wall panels or walls to the outdoors.

3 Install firestops and seals at penetrations through building floors, walls, or where required by fire codes.

4 Provide waterproof firestops and seals in specified locations.

G Raceway Separation:

1 Whenever possible, separate signal raceways from AC power or control raceways a minimum of 12 inches.

H Conduit Seals for Hazardous Areas:

1 Each conduit passing from a hazardous or corrosive area into a non-hazardous or non-corrosive area shall be provided with a seal fitting which may be located on either side of the boundary. The seal shall be located at the boundary in accordance with NEC requirements.

I Expansion Joints and Expansion Couplings:

1 At expansion joint crossings and where noted on the drawings, verify maximum design deflection. Use expansion coupling fittings. At crossings of expansion joints with 1 1/2-inch conduit and smaller, flex conduit may be used where acceptable.

J PVC Coated Conduit:

1 Conduit and fittings shall be installed such that the PVC coating is continuous and watertight and that no portion of the metal conduit or fittings is exposed to moisture. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

2 When clamping PVC coated conduit in a pipe vise, replace the jaw assembly with special vise adapters that do not damage the coating. When clamping in a chain vise for diameters less than 2 inches, wrap the clamp area with emery cloth (coarse surface against the coating). Use half-shell clamps for 2-inch and larger diameter PVC coated conduit.

3 Cut PVC coated conduit using a roller cutter and remove about a 1/4 inch of the exterior PVC coating to aid in threading the conduit. Use a reamer to remove any rough internal edges.

4 After threading is complete, clean the threads and conduit interior with a degreasing spray to prepare for the application of the touchup compound to ensure good adherence to the unprotected metal substrate.

5 When utilizing a hydraulic bender, use equipment designed to bend PVC coated conduit. If using a conventional hand bender, use the next larger size bending shoe to allow space for

the coating. Make hand bends using a specially coated bending hickey to reduce the potential coating damage when making sharp bends, saddles, or offsets.

6 Use special Z wrenches or strap wrenches (in lieu of standard adjustable pliers) to assemble PVC coated conduit and fittings to prevent damage to the coating. For small conduit sizes, Spin-It tools may be used to assemble the conduit and fittings. Apply touchup compound to any exposed threads, joints, scrapes, or nicks.

K Epoxy Coated Conduit:

1 Make conduit up tight with strap wrenches. Do not use pipe wrenches and channel locks for tightening. Patch damaged areas with the manufacturer's recommended materials. Build the patched area up to the full thickness of the original coating.

L Liquid-Tight, Flexible Metal Conduit:

1 Use liquid-tight in accordance with JIC standards and the following:

a Where specified or indicated on the drawings.

b Where flexibility is required for electrical raceways on equipment.

c For motor mounts.

2 The maximum length of conduit shall be 24 inches for conduits 1 1/2 inches or smaller and 36 inches for conduits 2 inches or larger. The terminating fittings and sealing shall be as specified.

M Non-Metallic Conduit:

1 Elbows, offsets, or 60-degree and larger bends in direct buried or concrete embedded conduit runs shall be galvanized rigid steel. The final length of conduit runs which rise up through concrete slabs or curbs shall be galvanized rigid steel, provided with grounding bushing.

2 Make connections with waterproof solvent cement.

3 PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the device and shall be terminated with a threaded male terminal adapter having a neoprene O-ring. Joints shall be made with standard couplings.

N Galvanized Rigid Steel Conduit (GRSC):

1 GRSC embedded in concrete below grade or in damp locations shall be made watertight by painting the entire male thread with metal primer paint before assembly.

3.02 INSTALLATION OF RACEWAYS FOR COMMUNICATIONS

A Comply with TIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B Communications conduit bends shall be large-radius field bends or manufactured conduit sweeps and long-radius elbows. Do not install cast type fittings or sharp bends.

C Installation in Equipment Rooms:

1 Protect existing telephone terminals and equipment which will remain in service during construction from mechanical injury and dust entry.

2 Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.

3 Install cable runway to route cables if conduits cannot be in these positions.

4 Secure conduits to backboard when entering room from overhead.

5 Extend conduits 6 inches above finished floor or 12 inches down from ceiling, terminating in insulating bushings.

6 Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.03 INSTALLATION OF RACEWAYS AND BOXES FOR FIRE ALARM.

A Fire alarm conduit and boxes installed in concealed locations or located in stairwells, storage rooms, electrical rooms, mechanical rooms, and utility rooms shall be factory-painted red.

B Exposed fire alarm conduits in finished spaces shall be painted to match adjacent wall and ceiling finishes.

3.04 BOXES

A Installation:

1 Mount boxes and outlets at center line, at heights shown on the drawings.

2 Install outlet boxes, sized by code, large enough to accommodate all wires, fittings, and devices.

3 Install multi gang boxes as required to accept devices with no more than one device per gang.

4 Equip all metallic boxes with grounding provisions.

5 Flush wall switch, and receptacle outlets used with conduit systems shall be a minimum of 4 inches square, 1 1/2 inches or more deep, with a one- or two gang plaster ring mounted vertically. Where three or more devices are at one location, use a one-piece multiple gang tile box or a gang box with a suitable device ring.

6 Wall bracket and ceiling, surface-mounted lighting fixture outlets shall be a minimum of 4 inches square and 1 1/2 inches deep with a 3/8-inch fixture stud where required. Wall bracket outlets shall have a single gang opening where required to accommodate fixture canopy. Provide larger boxes or extension rings where the quantity of wires installed requires more cubic capacity.

7 Boxes for communication systems shall be a minimum of 4 11/16 inches square and 3 1/2 inches deep. Provide communication outlet boxes with a one-gang plaster ring mounted vertically.

8 Boxes for special systems shall be suitable for the equipment installed. Coordinate size and type with the system supplier.

9 Install pull boxes where shown on the drawings or required by code. Use galvanized boxes of the size required by code with removable covers installed so that covers will be accessible after work is completed.

10 Install boxes flush with finished surfaces or not more than 1/8 inch back and install boxes level and plumb. Long screws with spacers or shims for mounting devices are not acceptable. Do not expose combustible materials to wiring at outlets.

11 Extend covers for flush mounted boxes in finished spaces a minimum of 1/4 inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.

12 Mount cast boxes or plaster trims for weatherproof outlets horizontally.

3.05 CONDUIT TYPE REQUIREMENTS

A Galvanized Rigid Steel Conduit (GRSC). Uses permitted:

1 Direct-buried.

2 Embedded or encased in concrete.

3 Exiting concrete (extend GRSC 18 inches beyond penetration).

4 Exposed in buildings from floor level to a height of 8 feet, except as noted below.

5 Exposed to weather, corrosive, or hazardous conditions, including interior exposures.

B PVC Coated Rigid Steel Conduit. Uses permitted:

1 Embedded or encased in concrete.

2 Exposed to weather, corrosive, or hazardous conditions.

C Electrical Metallic Tubing (EMT). Uses permitted:

1 In dry, protected locations.

2 Exposed at a height more than 8 feet above floor level, or more than 18 inches above floor level in HVAC equipment rooms, utility tunnels, communication equipment rooms, electrical rooms, or unoccupied spaces, unless otherwise noted on the drawings.

D Flexible Metal Conduit.

1 Use where flexibility is necessary, as at motors, transformers, recessed light fixtures, etc. Flexible conduit terminations at motors, transformers, etc., shall be limited to 18 inches.

E Polyvinylchloride Conduit (PVC), Schedule 40. Uses permitted:

1 Embedded or encased in concrete (use GRSC where conduits exit concrete work).

2 Direct-buried 18 inches or more below grade.

F Polyvinylchloride Conduit (PVC), Schedule 80. Uses permitted:

1 Direct-buried 18 inches or more below grade.

2 Embedded or encased in concrete (use GRSC where conduits exit concrete work and extend GRSC 18 inches beyond penetration).

3 Exposed to corrosive conditions inside building.

G Metal Raceway.

1 Use in dry, protected locations for equipment requiring multi-connection wiring or where subject to physical damage.

H High-Density Polyethylene Conduit (HDPE). Uses permitted:

1 Horizontal directional drilling installations.

3.06 RACEWAY AND CONDUIT SIZES

A Size raceways and conduits as indicated on the drawings. Where no size is indicated, size as follows:

1 Larger conduits shall be sized to code. Size for the quantity of conductors installed, based upon NEC tables.

2 Conduit installed underground or in concrete shall be 1 inch or larger.

3 Conduits shall be 3/4-inch minimum size with larger sizes as indicated on the drawings. Conduits with tenant lease space buildouts may use conduits smaller than 3/4-inch.

4 Communications conduit runs may be combined as follows:

a Two outlets: 1 1/4-inch size.

b Three outlets: 1 1/2-inch size.

3.07 FITTINGS

A Assemble metallic raceways and conduits in one continuous piece and secure to boxes, panels, etc. with appropriate fittings to maintain electrical continuity. All conduit joints shall be cut square and reamed smooth with all fittings drawn up tight.

3.08 PULL LINES

A Install nylon pull lines in all empty conduits where routing includes 25 feet or more in length or includes 180 degrees or more in bends.

B Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36 inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or termination point or intended future use.

END OF SECTION

26 0536

CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes a cable tray system.

1.02 SUBMITTALS

A Submit product data and shop drawings for cable trays and accessories.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A B-line, or equal.

2.02 CENTER-SUPPORTED LADDER TRAY

A Construct ladder trays using a center rectangular aluminum tube which forms a spine to which cross rungs are attached on 3-inch centers. The cross rungs shall be bent up at their ends to a height of 4 inches to form a center-supported, open-sided, ladder-like assembly. Side rails will not be permitted.

1 The trays shall be 12 or 24 inches wide as indicated on the drawings.

2 Ladder trays shall be constructed of 6063 T6 aluminum alloy and shall be designed to support a load of 50 pounds per linear foot when supported on 12-foot centers.

3 Cross rungs shall be fastened at right angles to the top of the spine with the rungs bent upward at the outer ends to hold the cables in the tray.

4 All edges of cable trays, fittings, and connectors shall be rounded and smooth to prevent injury to cable during its installation.

B Accessories:

1 Splicing plates and connectors shall be the same size as the connecting tray.

2 Splice connectors shall be two-bolt, rectangular splice connectors which telescope into the spine of the tray. Splice connectors shall allow for thermal expansion/contraction of the tray system. The splice connectors shall be provided with a vertical hole to accept a 1/2-inch threaded rod which is used to support the tray in an overhead application.

3 Support rods shall be threaded and 1/2 inch in diameter.

4 Furnish and install stiffeners and sway braces as required for eccentric loading.

PART 3 EXECUTION

3.01 CABLE TRAY SYSTEM

A The cable tray system shall be supported from the utility tunnel ceiling at 12-foot maximum intervals or as indicated on the drawings. Place supports for tray fittings within 2 feet of each fitting extremity.

B Use splice connectors to join sections of tray.

C Install sway support brackets as required.

D Keep cable trays free of all materials except the conductors which they are intended to support.

E Bond and effectively ground all metal sections of the cable tray system.

END OF SECTION

26 0543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes conduit, ducts, duct accessories, handholes, boxes and manholes constructed and installed to form a complete underground raceway system.

1.02 REFERENCES

A AASHTO: American Association of State Highway and Transportation Officials

1 AASHTO Specification for Highway Bridges

B ACI: American Concrete Institute

1 ACI 318: Building Code Requirements for Structural Concrete and Commentary

C ASTM: American Society for Testing and Materials

1 ASTM A48: Standard Specification for Gray Iron Castings

2 ASTM C478: Standard Specification for Precast Reinforced Concrete Manhole Sections

D NEC: National Electrical Code

E UL: Underwriters Laboratories

1 UL 651: Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

2 UL 651A: Standard for Schedule 40, 80, High-Density Polyethylene (HDPE) Conduit and Fittings

1.03 SUBMITTALS

A Submit product data and cut sheets.

PART 2 PRODUCTS

2.01 PRECAST HANDHOLES AND PULL BOXES

A Acceptable Manufacturers: Oldcastle, Christy, Hanson, Hubbell, or equal.

B Handholes and pull boxes are defined as boxes up to a size of 17 inches x 30 inches.

C Construct the box using precast concrete or polymer concrete with an open bottom unless noted otherwise on the drawings.

D The box shall be rated for incidental traffic. It shall be suitable for H-20 loading in off-street locations that are not subject to high density traffic.

E Engrave the cover to indicate the contents such as “ELECTRIC,” “COMM,” “LIGHTING,” “SIGNALS,” or as noted on the drawings.

F The cover shall be a non-skid surface, include lift or pull slots, and be capable of being secured to the body with fasteners.

G The manufacturer’s name and model number shall be permanently indicated to an interior wall face.

2.02 PRECAST CONCRETE VAULTS

A Acceptable Manufacturers: Oldcastle, Hanson, or equal.

B Vaults are defined as boxes larger than 17 inches x 30 inches.

C Vaults shall be precast concrete, solid bottom with a knocked-out sump to allow for drainage, embedded galvanized channels in each wall, a 1-inch diameter ground rod knockout in the floor, and galvanized pull/lift irons in each corner. Vaults shall have an opening in the bottom to allow drainage.

D Construct vaults using concrete that has a minimum 4,000 psi strength at 28 days.

E Design:

1 Design tops and walls of structures for AASHTO H-20 highway loading, with 30 percent loading added for impact.

2 Design precast structures in accordance with AASHTO Specification for Highway Bridges. Design concrete and reinforcing in accordance with ACI Code 318. Precast units shall conform to ASTM C478.

3 Design walls to withstand all soil pressures, taking into consideration the soil to be encountered and groundwater level present at the site. Assume ground water level is at ground surface unless a lower water table is indicated in the boring logs.

4 Precast vaults shall be designed and constructed not to float.

5 Assembled sections shall have mating edges with tongue-and-groove joints. Design joints to firmly interlock adjoining components and provide waterproof junctions. Joints shall be sealed watertight using preformed plastic strips installed in accordance with the manufacturer's instructions.

6 Slope floor 2 percent in all directions to the sump.

7 Steel components other than reinforced steel shall be hot dip galvanized after fabrication.

8 Identify vaults using the manufacturer's name embedded in, or otherwise permanently attached to, an interior wall face.

F Conduit entries through vertical vault walls shall be through cast-in-place molded plastic duct connections such as Term-A-Ducts unless otherwise noted on the drawings.

2.03 DUCT LINES

A Size: Except where otherwise shown on the drawings, ducts and conduits shall not be less than 4-inch trade size.

B Ducts (Direct Buried):

1 Rigid Non-Metallic Conduit: Type II PVC Schedule 40, suitable for use with 90 degrees C rated wire. Conduit shall conform to UL Standard 651 and carry appropriate UL listing for above- and below-ground use.

2 Rigid Non-Metallic Polyethylene Conduit: HDPE Schedule 40, 80, suitable for use with 90 degrees C rated wire. Conduit shall conform to UL Standard 651A and shall have appropriate UL listing for below-ground use.

3 Rigid Metal Conduit: UL 6 galvanized rigid steel. Where metal conduit transitions from concrete to soil, provide supplementary corrosion protection (20 MIL corrosion protection tape half-wrapped) a minimum of 4 inches on each side of the point where the raceway emerges.

C Manufactured bends shall be not less than 36 inches in radius for conduits 4 inches in diameter or larger. Fiberglass manufactured bends are acceptable.

D Acceptable Manufacturers: Carlon, or equal.

E Factory-fabricated rigid PVC vertical and horizontal interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum of 3 inches separation between ducts while supporting ducts during concreting or backfilling.

2.04 GROUND RODS

A Ground rods shall be copper-clad steel, 3/4-inch diameter, and 10 feet long.

2.05 GROUND WIRE

A Ground wire shall be stranded bare copper No. 6 AWG minimum.

2.06 CONDUIT EXPANSION/DEFLECTION FITTINGS

A Acceptable Manufacturers: Crouse-Hinds, O-Z/Gedney, or equal.

B Conduit expansion/deflection fittings in embedded runs shall be rated for indoor use, outdoor use, buried underground, or embedded in concrete in non-hazardous areas.

C Fittings shall allow axial expansion or contraction up to 3/4 inch and angular misalignment of the axes of the coupled runs in any direction to 30 degrees. Inner sleeves shall maintain constant inside diameter in any position and provide smooth insulated wireway for protection of wire insulation.

D Fittings shall have a watertight flexible neoprene outer jacket and tinned copper flexible braid grounding strap.

E Use with galvanized rigid steel conduit or PVC Schedule 40 conduit utilizing rigid metal conduit nipples and rigid metal to PVC adapters.

PART 3 EXECUTION

3.01 PRECAST HANDHOLES AND PULL BOXES INSTALLATION

A Install precast handholes and pull boxes on a solid ring of base material such as concrete around the outer edge to prevent settlement. The base material shall include openings that allow drainage from the box into the soil. Set boxes plumb and elevate slightly above surrounding grade to prevent them from becoming the water collection points. Seal conduit ends to prevent debris from entering the raceway.

3.02 PRECAST VAULTS INSTALLATION

A Locate vaults at the approximate location shown on the drawings with due consideration given to other utilities, grades, duct lines, obstructions, and paving.

B Install on a level bed of well-tamped gravel or crushed stone, well-graded from the 1-inch to 2-inch sieve. Compact rock to prevent settlement, and then install drainage fabric over the area where the vault sump will be located. The sump shall be a clear opening from the vault interior to the surrounding surface to provide a pathway for water.

C In paved areas, set top of vault plumb and flush with finished surface. In unpaved areas, set vault top slightly higher than surrounding area to prevent the vault from collecting surrounding water.

D Install a ground rod in each vault through the ground rod knockout in the floor.

E Install a bonding conductor along the perimeter of the interior walls. Bond all metallic parts including all embedded channels, frames, ladders, etc. Connect the ground rod to this bonding conductor.

F In cases where Term-A-Ducts were not provided at conduit entries, fill the breakout windows with concrete or non-shrink grout after all ducts have been installed. Provide conduit entries with a smooth bell end to prevent cable damage.

G Affix a laminated plastic label to the vault wall adjacent to each conduit entry/exit. The label shall indicate the conduit number and its destination. For example, “#1 to CVLT-1234” indicates that conduit #1 extends to vault CVLT-1234. Labels shall be engraved phenolic that is suitable for the environment. Acceptable attachment methods include stainless steel fasteners and permanent epoxy.

H Install a Confined Space Identification sign to the underside of the vault lid or affix the sign to near the top of the vault wall with stainless steel screws.

3.03 TRENCHING

A Work with extreme care near existing utilities to avoid damaging them. Cut the trenches neatly and uniformly.

3.04 DUCT LINE INSTALLATIONS

A General:

1 Duct line shall be in accordance with the NEC, as shown on the drawings and as specified.

2 Slope duct to drain toward manholes and away from building and equipment entrances. Pitch shall be not less than 4 inches in 100 feet. Curved sections in duct lines shall consist of long sweep bends with a minimum radius of 50 feet in the horizontal and vertical directions unless noted otherwise on the drawings. The use of manufactured bends is limited to building entrances and stub-ups to equipment.

3 Underground conduit stub-ups to equipment inside buildings shall be galvanized rigid steel and shall extend at least 10 feet outside the building foundation. Stub-ups to equipment, mounted on outdoor concrete slabs, shall be galvanized rigid steel, and shall extend at least 5 feet from edge of slab. Install insulated grounding bushings on the terminations. Couple the steel conduits to the ducts with suitable adapters and encase with 3 inches of concrete.

4 Upon completion of the duct bank installation, pull a standard flexible mandrel through each duct. The mandrel shall be at least 12 inches long and shall have a diameter 1/2 inch less than the inside diameter of the duct. After mandreling, pull a brush with stiff bristles through each duct to remove the loosened particles. The diameter of the brush shall be equal to or slightly larger than the diameter of the duct.

5 Seal the ducts and conduits at building entrances and at outdoor equipment terminations with a suitable non-hardening compound.

6 Conduits shall be joined, terminated, and sealed with fittings, materials and methods recommended by the manufacturer. Supply all necessary fittings and materials for a complete conduit/duct system.

3.05 UTILITY WARNING TAPE AND LOCATE WIRE

A Place a continuous strip of utility warning tape approximately 12 inches above ducts or conduits before backfilling trenches. See Section 31 2300, for tape description and installation requirements.

B Provide utility locate wire as described in Section 31 2300.

C Extend locate wire to near vault top and secure with an additional 2 feet of spare loop. Additional conductor length allows equipment used by locators to be positioned outside the vault, thereby eliminating a confined space entry.

END OF SECTION

26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A This Section includes the following:

1 Warning labels and signs.

2 Equipment identification labels.

1.02 SUBMITTALS

A Product Data: For each electrical identification product indicated.

1.03 QUALITY ASSURANCE

A Comply with ANSI A13.1.

1.04 COORDINATION

A Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 PRODUCTS

2.01 WARNING LABELS AND SIGNS

A Comply with NFPA 70 and 29 CFR 1910.145.

B Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

C Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches.

D Fasteners for Signs: Self-tapping, stainless-steel screws, or stainless-steel machine screws with nuts and flat and lock washers.

2.02 EQUIPMENT IDENTIFICATION LABELS

A Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

B Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

PART 3 EXECUTION

3.01 APPLICATION

A Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1 Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.

2 Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1 Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

C Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment. Systems include power, lighting, control, monitoring, and alarm systems unless equipment is provided with its own identification.

1 Labeling Instructions:

a Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.

b Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.

2 Equipment to Be Labeled:

a Panelboards, electrical cabinets, and enclosures.

b Disconnect switches.

c Contactors.

3.02 INSTALLATION

A Verify identity of each item before installing identification products.

B Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C Apply identification devices to surfaces that require finish after completing finish work.

D Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E Attach non adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

END OF SECTION

26 2300

LOW-VOLTAGE METAL ENCLOSED SWITCHGEAR

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes dead-front type, low-voltage metal-enclosed switchgear, utilizing draw-out power air circuit breakers.

1.02 REFERENCES

A The low-voltage metal-enclosed switchgear assembly and all components shall be designed, manufactured, and tested in accordance with the following standards:

1 ANSI: American National Standards Institute

a ANSI C37.20.1: Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

b ANSI C37.50: Low-Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures

c ANSI C37.51: For Switchgear - Metal Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies-Conformance Test Procedures

2 IBC: International Building Code

3 NEMA: National Electrical Manufacturers Association

4 UL: Underwriters Laboratories

a UL 1558: Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

1.03 SUBMITTALS

A Submit the following no later than 30 days after issuance of Notice to Proceed:

1 Master drawing index.

2 Front view and plan view of the assembly.

3 Three-line diagram.

4 Schematic diagram.

5 Nameplate schedule.

6 Component list.

7 Conduit space locations within the assembly.

8 Assembly ratings including:

a Short-circuit rating.

b Voltage.

c Continuous current rating.

9 Major component ratings including:

a Voltage.

b Continuous current rating.

c Interrupting ratings.

10 Cable terminal sizes.

11 Connection details between close-coupled assemblies.

12 Composite front view and plan view of close-coupled assemblies.

13 Key interlock scheme drawing and sequence of operations.

14 Anchoring and mounting details.

B Submit the following upon substantial completion of the work:

1 Final as-built drawings and information. Incorporate all changes made during the manufacturing process.

2 Wiring diagrams.

3 Certified production test reports.

4 Installation information.

5 Seismic certification and equipment anchorage details.

6 Instruction books and/or leaflets.

7 Recommended renewal parts list.

1.04 QUALITY ASSURANCE

A The manufacturer of the assembly shall be the manufacturer of the low-voltage power air circuit breaker installed within the assembly.

B For the equipment specified herein, the manufacturer shall be ISO 9000, 9001, or 9002 certified.

C The switchgear assembly and circuit breakers shall be suitable for and certified to meet all applicable seismic requirements of the IBC for the ground motion accelerations corresponding to the project location. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The tests shall fully envelope this response spectrum for all equipment natural frequencies up to at least 35 Hz.

D Switchgear to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

1.05 REGULATORY REQUIREMENTS

A The switchgear shall be listed and labeled in accordance with UL 1558.

1.06 DELIVERY, STORAGE, AND HANDLING

A Handle and store equipment in accordance with the manufacturer’s instructions. Include one copy of these instructions with the equipment at time of shipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A General Electric, Square D Company, Siemens, Eaton Cutler-Hammer, or equal.

2.02 RATINGS

A Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 600 volts maximum AC service.

B The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions, when connected directly to a power source having available fault current 65,000-amperes symmetrical at rated voltage as shown on the drawings.

C The bus system shall have a minimum ANSI 4-cycle short-circuit withstand rating of 100,000-amperes symmetrical.

D Circuit breakers shall have a minimum symmetrical interrupting capacity of 65,000-amperes. To assure a fully selective system, circuit breakers shall have 30-cycle short time withstand ratings equal to their symmetrical interrupting ratings, regardless of whether equipped with instantaneous trip protection or not.

E All ratings shall be tested to the requirements of ANSI C37.20.1, C37.50, and C37.51, and shall be UL witnessed and approved.

2.03 CONSTRUCTION

A The switchgear shall consist of the required number of vertical sections, bolted together to form a rigid assembly. Cover the sides with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure. Fabricate the rear covers in two pieces for ease of handling and shall be mounted using captive hardware.

B Provide the assembly with adequate lifting means and capability of being moved into installation position and bolted directly to floor. Provisions shall be made for jacking of shipping groups, for removal of skids or insertion of equipment rollers. Base of assembly shall be suitable for rolling directly on pipes without skids. Equip the base with slots in the bottom side frame members to accommodate the forks of a lift truck. Construct the base frame member so that the forks cannot protrude into the breaker, bus, or cable compartments of the assembly.

C Each vertical steel unit, forming part of the switchgear line-up, shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment, and a rear cabling compartment. Each individual circuit breaker compartment, or cell, shall be segregated from adjacent compartments and sections, including the bus compartment, by means of steel barriers. Equip with draw out rails and primary and secondary disconnecting contacts. Provide removable hinge pins on the breaker compartment door hinges. Current transformers for feeder instrumentation, where shown on the drawings, shall be located within the appropriate breaker cells.

D The stationary part of the primary disconnecting devices for each power circuit breaker shall consist of a set of contacts extending to the rear, through a glass polyester insulating support barrier. Corresponding moving finger contacts suitably spaced shall be furnished on the power circuit breaker studs which engage in only the connected position. Provide the assembly with multiple silver-to-silver full floating high-pressure point contacts with uniform pressure on each finger maintained by springs. Include in each circuit the necessary three-phase bus connections between the section bus and the breaker line side studs. Equip load studs with insulated copper load extension buses terminating in solderless-type terminals in the rear cable compartment of each structure. Bus extensions shall be tin-plated where outgoing terminals are attached.

E The secondary disconnecting devices shall consist of floating fingers mounted on the removable unit and engaging flat contact segments at the rear of the compartment. The

secondary disconnecting devices shall be silver-plated and sliding contact engagement shall be maintained in the CONNECTED and TEST positions.

F Equip the removable power circuit breaker element with disconnecting contacts, wheels, and interlocks for draw-out application. It shall have four positions: CONNECT, TEST, DISCONNECT, and WITHDRAWN, all which permit closing the compartment door. The breaker draw out element shall contain a worm gear levering “in” and “out” mechanism with removable lever crank. Provide mechanical interlocking so that the breaker is in the tripped position before levering “in” or “out” of the cell. Include a provision for padlocking open to prevent manual or electric closing. The padlocking shall also secure the breaker in the connected, test, or disconnected position by preventing levering.

G Mount an insulating flash shield above each circuit breaker to prevent flashover from the arc chutes to ground.

H Provide a rear compartment steel barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars.

I The switchgear shall be completely factory assembled, low-voltage metal-enclosed switchgear, utilizing power air circuit breakers as specified herein.

J Provide a metal barrier full height and depth between adjacent vertical structures in the cable compartment.

2.04 BUS

A Bus bars shall be tin-plated copper. Mount main horizontal bus bars with all three phases arranged in the same vertical plane. Size the bus based on ANSI standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

B Provide a full capacity neutral bus and extend the entire length of the switchgear.

C Furnish a copper ground bus firmly secured to each vertical section structure and extend the entire length of the switchgear. The ground bus short time withstand rating shall meet that of the largest circuit breaker within the assembly.

D All hardware used on conductors shall be high-tensile strength and zinc plated. Provide all bus joints with Belleville-type washers, or equal.

2.05 WIRING/TERMINATIONS

A Furnish small wiring, necessary fuse blocks, and terminal blocks within the switchgear, as required. Control components mounted within the assembly shall be suitably marked for identification corresponding to the appropriate designations on manufacturer’s wiring diagrams.

B All control wire shall be type SIS. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchor. All current transformer secondary leads shall first be connected to conveniently accessible short circuit terminal blocks before connecting to any other device. Provide four shorting screws with provisions for storage. Provide all groups of control wires leaving the switchgear with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring. Provide plug-in terminal blocks for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via removable trays within each circuit breaker cubicle. Control fuses for each electrically operated circuit breaker shall also be in these trays.

C Provide NEMA 2-hole mechanical-type lugs for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.

D Provide a termination system such that no additional cable bracing, tying, or lashing is required to maintain the short circuit withstand ratings of the assembly through 200 kA.

E Provide lugs in the incoming line section for connection of the main grounding conductor. Provide additional lugs for connection of other grounding conductors as indicated on the drawings.

2.06 CIRCUIT BREAKERS

A Protective devices shall be draw-out low-voltage power air circuit breakers. Breakers shall be UL listed for application in their intended enclosures for 100 percent of their continuous ampere rating.

B Breakers shall be manually operable and electrically operable.

C Provide circuit breakers with trip units as shown on the drawings.

2.07 ELECTRONIC TRIP UNITS

A Equip each draw-out low-voltage power circuit breaker with a solid-state tripping system consisting of three current sensors, microprocessor-based trip device, and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time-current protection functions. True RMS sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached.

B Interchangeable rating plugs shall establish the maximum continuous trip ratings of each circuit breaker. Rating plugs shall be fixed type as indicated. Interlock rating plugs so they are not interchangeable between frames such that a breaker cannot be closed and latched with the rating plug removed.

C Provide complete system selective coordination by the addition of the following individually adjustable time/current curve shaping solid-state elements:

1 Long delay pick-up and time.

2 Short delay pick-up and time, and selective flat or I2t curve shaping.

3 Adjustable instantaneous pick-up including adjustable ground fault current pick-up and time, and selective flat or I2t curve shaping.

D The microprocessor-based trip unit shall have both powered and unpowered thermal memory to provide protection against cumulative overheating should several overload conditions occur in quick succession.

E For trip units that do not have an instantaneous adjustment, provide a discriminator circuit to prevent the breaker from being closed and latched on to a faulted circuit.

F Internal ground fault protection settings shall not exceed 1200 amperes. Provide neutral ground fault sensor for all breakers.

G The trip unit shall have an information system that utilizes battery backed-up LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an automatic trip. Provide a trip reset button to turn off the LED indication after an automatic trip. A test push-button shall energize an LED to indicate battery status.

H Provide a trip unit with a representation of the time-current curve on the trip unit that indicates the protection function settings. The unit shall be continuously self-checking and provide LED indication that the internal circuitry is being monitored and is fully operational.

I The trip unit shall contain an integral test panel with a test selector switch and a test push-button. The test selector switch shall enable the user to select the values of test current within

a range of available settings. The basic protection functions shall not be affected during test operations. The breaker shall be capable of being tested in either the TRIP or NO TRIP test mode. Provide a keyed receptacle for use with an optional auxiliary power module. The auxiliary power module shall allow the breaker trip unit to be tested with a 120-volt external power source.

J LED Display:

1 Provide a four-digit, 3/4-inch high, LED alphanumeric display to indicate the following data:

a Cause of trip.

b Instantaneous value of maximum phase and ground current.

c Level of fault current that initiated an automatic trip operation.

2 Display shall be high output LED for low-level light readability. LCD displays are unacceptable.

K The trip unit shall include a power/relay module which shall supply control power to the readout display. Following an automatic trip operation of the circuit breaker, it shall maintain the cause of trip history and the mode of trip LED indication if its internal power supply is available. Internal relays shall provide contacts for remote indication of mode of trip and high load.

L Provide a red LED on the face of the trip unit pre-set to turn on when 85 percent of the trip setting is exceeded (a 40 second delay shall be provided to avoid nuisance alarms).

M Metering display accuracy of the complete system including current sensors, auxiliary CTs, and the trip unit shall be plus/minus 2 percent of full scale for current values.

N The trip unit shall include a potential transformer module, suitable for operation up to 600V, 50/60 Hz. The primary of the PTM shall be connected internally to the load side of the circuit breaker through a dielectric disconnect plug. The unit shall calculate energy monitoring parameters as follows:

1 Peak demand (megawatts).

2 Present demand (megawatts).

3 Energy consumption (megawatt hours).

O The energy-monitoring parameter values (peak demand, present demand, and energy consumption) shall be indicated in the trip unit alphanumeric display panel.

P Metering display accuracy of the complete system of full scale shall be plus/minus 3 percent for power values, plus/minus 4 percent of full scale for energy values.

Q Equip the trip unit to permit communication via a network to the SMS 3000 system. Provide an address register for identification on the network. All monitored values shall be transmittable over the network to the SMS 3000 system. The trip units shall be capable of initiating open and close commands, delivered over the network from a remote location.

2.08 CENTRAL DISPLAY UNIT

A Provide a central display unit on each of the unit substations main breakers (one per unit substation) capable of displaying information and data from trip units specified above.

2.09 MISCELLANEOUS DEVICES

A Provide key interlocks, as indicated on the drawings, to keep the circuit breakers trip-free when actuated.

B Provide fused control power transformers for each load center (two per double-ended unit substation) or as required for proper operation of the equipment. Provide a manual disconnect ahead of the primary fuses. Control power transformers shall have adequate capacity to supply power to the transformer cooling fans.

2.10 UTILITY METERING

A Provide switchboard type current transformer metering cabinet in NEMA 3R enclosure.

B Remote meter to be mounted to the side of CT section. Refer to COPA Urban services standards and guidelines, chapter 8, section 8.14

2.11 ENCLOSURES

A The enclosure shall be NEMA 1 or NEMA 3R.

2.12 NAMEPLATES

A Furnish self-adhesive nameplates, mounted on the face of the assembly, for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating.

B Furnish master nameplate giving switchgear designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.

C Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's drawings.

2.13 FINISH

A All exterior and interior steel surfaces of the switchgear shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchgear shall be the manufacturer's standard.

2.14 ACCESSORIES

A Provide a traveling-type circuit breaker lifter, rail-mounted on top of switchgear.

PART 3 EXECUTION

3.01 FACTORY TESTING

A The switchgear shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchgear shall be tested to assure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities.

B The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute or 1800 volts for one second between live parts and ground, in accordance with ANSI C37.20.1

C A certified test report of all standard production tests shall be available to the Owner upon request.

3.02 INSTALLATION

A Provide all necessary hardware to secure the assembly in place.

B Install and check the equipment in accordance with the manufacturer's recommendations and the drawings. Include but not be limited to:

1 Ensuring that the pad location is level to within .125 inches.

2 Ensuring that bus bars are torqued to the manufacturer's recommendations.

3 Assembling shipping sections, removing shipping braces, and connecting shipping split mechanical and electrical connections.

4 Securing assemblies to foundation or floor channels.

5 Measuring and recording megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four-wire system only).

6 Inspecting and installing circuit breakers in their proper compartments.

END OF SECTION

26 2416

PANELBOARDS

PART 1 GENERAL

1.01 SUMMARY

A This Section includes the following:

1 Panelboards.

1.02 DEFINITIONS

A RMS: Root mean square.

B Panelboard: Refers to load center.

1.03 SUBMITTALS

A Product Data: For each type of panelboard, overcurrent protective device, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B Shop Drawings: For each panelboard and related equipment.

1 Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a Enclosure types and details for types other than NEMA 250, Type 1.

b Bus configuration, current, and voltage ratings.

c Short-circuit current rating of panelboards and overcurrent protective devices.

d UL listing for series rating of installed devices.

C Field quality-control test reports including the following:

1 Test procedures used.

2 Test results that comply with requirements.

3 Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D Panelboard Schedule: For installation in panelboard.

E Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section, Closeout Procedures, include the following:

1.04 QUALITY ASSURANCE

A Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C Panelboards to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

D Comply with NEMA PB 1.

E Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1 Panelboards, Overcurrent Protective Devices:

a Eaton Corporation; Cutler-Hammer Products.

b Siemens Energy & Automation, Inc.

c Square D.

d Or Equal.

2.02 MANUFACTURED UNITS

A Fabricate and test panelboards according to IEEE 344.

B Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.

1 Front: Secured to box with trim clamps or screws. Match box dimensions.

2 Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C Phase and Ground Buses:

1 Material: Tin-plated aluminum or manufactures' standard material.

2 Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

2.03 PANELBOARD SHORT-CIRCUIT RATING

A UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.04 BRANCH PANELBOARDS

A Branch circuit panels shall be bolt-in circuit breaker type with copper bussing. Panels shall be fitted with flush lift latches and locks keyed alike. Deliver all panel keys at completion of the project.

B Panels shall be door-in-door construction.

2.05 OVERCURRENT PROTECTIVE DEVICES

A Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.

1 Thermal-Magnetic Circuit Breakers: Inverse time-current 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.

PART 3 EXECUTION

3.01 INSTALLATION

A Install panelboards according to NEMA PB 1.1.

B Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C Mount plumb and rigid without distortion of box.

D Install overcurrent protective devices.

E Install filler plates in unused spaces.

3.02 IDENTIFICATION

A Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section, Electrical.

B Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C Panelboard Nameplate: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.03 CONNECTIONS

A Ground equipment according to Section 26 0526, Grounding and Bonding for Electrical Systems.

B Connect wiring according to Division 26 section, Electrical.

3.04 FIELD QUALITY CONTROL

A Prepare for acceptance tests as follows:

1 Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2 Test continuity of each circuit.

B Perform the following field tests and inspections and prepare test reports:

1 Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2 Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.05 CLEANING

A On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

26 2726

WIRING DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

A This section describes wiring devices, plates, and blank plates for outlet boxes.

1.2 SUBMITTALS

A Submit product data, shop drawings, and samples.

PART 2 PRODUCTS

2.1 GENERAL

A Wiring devices shall be specification grade, with special devices as noted on the drawings. Should the drawings indicate a device other than those listed herein without reference to catalog number, such device shall be of the same grade and manufacturer as specified below. Furnish a matching cap for all special purpose devices that do not have the common 120V NEMA 5 15R or 5 20R configuration.

B All lighting switches and duplex receptacles installed shall be by the same manufacturer and shall be identical in appearance, unless noted otherwise.

2.2 WALL SWITCHES

A Acceptable Manufacturers: Arrow Hart, Bryant, Eagle, General Electric, Hubbell, Leviton, Pass & Seymour, Sylvania, Lutron, or equal.

B Line Voltage Switches: 20 ampere, 277V, quiet type, grey exposed finish, back and side wired, Hubbell 1221 series.

C Lighted Handle Switches: 20 ampere, 120V or 277V, red handle with neon pilot light, Hubbell 1221 PL series.

D Momentary Contact Switches: 15A, SPDT, center off, grey exposed finish, Hubbell 1556 T.

E Key Switches: 20A, SPST, lock type, Hubbell 1201 L with 1209 key.

2.3 DIMMERS

A Acceptable Manufacturers: Lutron, Prescolite, or equal.

B General: Solid state silicone gated with RFI filter. Linear slide control with positive on/off switch for standard wall box mounting.

1 Incandescent Dimmers: Single manual local control with lamp debuzzing coil, 600 to 2000-watt capacity, 120V, white finish. Sizes as indicated on the drawings. Lutron Nova N series.

2 Fluorescent Dimmers: Single manual local controls, 10, 20 or 30 F40 lamp capacity with low end dimming adjustment, 120V, white finish. Lutron NF series.

3 LED Dimmers: Single manual local controls, 250-watt capacity, 120V, white finish. Lutron DVCL Series or approved equal.

2.4 RECEPTACLES

A Acceptable Manufacturers: Arrow Hart, Bryant, Eagle, General Electric, Hubbell, Leviton, Pass & Seymour, Sylvania, or equal.

B General Application Duplex: 3 wire, 2 pole grounding, NEMA 5 20R, grey nylon exposed finish, back and side wired, Hubbell 5362 series.

C UPS System Duplex: 3-wire, 2-pole grounding, NEMA 5-20R, black nylon exposed finish, back and side wired, Hubbell 5362 series.

D Emergency System Duplex: NEMA 5 20R, lighted red nylon exposed finish, back and side wired, Hubbell 8300 R series.

E Isolated Grounding Duplex: NEMA 5 15R, orange nylon exposed finish, back and side wired, Hubbell IG 5262 series.

F Ground Fault Interrupting Duplex: Feed through, NEMA 5 20R, grey nylon exposed finish, Hubbell GF 5362 series.

G Pay Phone Outlets: NEMA 5 15R receptacle, stainless steel plate with hanger, Hubbell No. 5235.

H Special Purpose Receptacles: As noted on the drawings. Provide with NEMA configurations.

2.5 PLATES

A Acceptable Manufacturers: Arrow Hart, Appleton, Bryant, Eagle, General Electric, Hubbell, Leviton, Pass & Seymour, Sylvania, or equal.

B Self-Adhesive Labels: 2 Mil UL® Recognized Peel and Stick Polyester Label, UL® Recognized Clear Polyester overlaminate. Provide engraving as indicated on the drawings.

C Receptacle Weatherproof: Gasketed cast aluminum, double lift, cover mounted horizontally with hinges up, 3-1/4-inch internal depth, lockable. UL listed for wet locations with cord plug inserted. Red Dot Code Keeper Extra-Duty While-in-Use Cover series, or equal.

D Switch Weatherproof: Gasketed cast aluminum switch operator. Appleton FSK series.

E Tamperproof: Flush cast aluminum locking cover plate, cylinder type lock, master keyed, Pass & Seymour 4600 series.

2.6 OCCUPANCY SENSORS

A Wall-Box Mounted: Passive infrared type, 180-degree coverage, automatic-on, 3-wire type (no minimum load), daylight override, adjustable time-out, and override off switch. Sensorswitch #WSD (line voltage), Sensorswitch #WSD-CU (low voltage), Wattstopper #WS, or pre-bid approved equal.

B Ceiling Mounted: Dual technology type, 360-degree coverage, automatic-on, adjustable time-out, low- or line-voltage as shown on the drawings, automatic gain control, surface mounted, with power pack as required. Sensorswitch #PDT-CM/CU-20, Wattstopper series WP1R, or pre-bid approved equal.

C Relay Output: Sensors shall provide a single pole double throw isolated relay contact for use by the HVAC control system.

PART 3 EXECUTION

3.1 INSTALLATION

A Devices and finish plates shall be installed plumb with building lines. Wall-mounted receptacles shall be installed vertically at the centerline height shown on the drawings.

B Install finish plates and devices after final painting is complete. Scratched or splattered finish plates and devices will not be accepted.

C Special plugs, such as cord caps furnished with the receptacles, shall be furnished in their cartons.

3.2 COORDINATION

A The drawings indicate the approximate location of all devices. Refer to architectural elevations, sections, and details for exact locations.

B Work with the equipment installer to coordinate the locations and methods of connection to devices mounted in or near cabinets, counters, benches, and similar equipment.

3.3 OCCUPANCY SENSORS

A Locate sensors to provide maximum coverage of the room, to operate as someone enters the room, and to avoid false operation due to persons outside the room passing an open door.

B Provide additional sensing heads as necessary to achieve complete coverage of each room.

C Set sensitivity as required to provide small movement coverage throughout the room without extending coverage beyond the room.

D Test system performance with the sensor timing set to the minimum time delay available. Once complete coverage of a given room has been demonstrated, set the delay to 15 minutes.

3.4 FIELD TESTING

A Receptacles shall be tested for line-to-neutral, line-to-ground, and neutral-to-ground faults. Correct any defective wiring.

END OF SECTION

26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 DESCRIPTION

A Provide switches as indicated on the drawings, in the specifications and where required by the National Electrical Code, even though not indicated. Provide fused or non-fused switches as shown on the drawings and as required by equipment manufacturer or circuit requirements.

B This section describes the following individually mounted, enclosed switches and circuit breakers:

1 Fusible switches.

2 Nonfusible switches.

3 Molded-case circuit breakers.

4 Low-voltage and current-limiting fuses

5 Enclosures.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 26 0529, Hangers and Supports for Electrical Systems

B Section 26 0553, Identification for Electrical Systems

1.03 DEFINITIONS

A GFCI: Ground-fault circuit interrupter.

B HD: Heavy duty.

C RMS: Root mean square.

D SPDT: Single pole, double throw.

1.04 REFERENCES

A CFR: Code of Federal Regulations

1 29 CFR 1910.7: Definition and Requirements for a Nationally Recognized Testing Laboratory

B NEC: National Electric Code

C NECA: National Electrical Contractors Association

1 NECA 1: Standard Practice of Good Workmanship in Electrical Construction

D NEMA: National Electrical Manufacturers Association

1 NEMA FU 1: Low-Voltage Cartridge Fuses

2 NEMA PB 1.1: General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 V or Less

3 NEMA PB 2.1: General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 V or Less

E NETA: International Electrical Testing Association

1 NETA ATS: Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

F NFPA: National Fire Protection Association

1 NFPA 70: National Electric Code

G UL: Underwriters Laboratories

1 UL 198C: Standard for Safety for High-Interrupting-Capacity Fuses, Current-Limiting Types

2 UL 198D: Class K Fuses

3 UL 198E: Class R Fuses

4 UL 198H: Class T Fuses

1.05 SUBMITTALS

A Product Data: Submit for each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1 Enclosure types and details for types other than NEMA 250, Type 1.

2 Current and voltage ratings.

3 Short-circuit current rating.

4 UL listing for series rating of installed devices.

5 Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B Field quality-control test reports including the following:

1 Test procedures used.

2 Test results that comply with requirements.

3 Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C Operation and Maintenance Data: Include data for enclosed switches and circuit breakers in operation and maintenance manuals. In addition to items specified in Division 01, include the following:

1 Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2 Time-current curves, including selectable ranges for each type of circuit breaker.

1.06 QUALITY ASSURANCE

A Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OR-OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1 Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C Comply with NFPA 70.

D 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.

PART 2 PRODUCTS

2.01 FUSIBLE AND NON-FUSIBLE SWITCHES

A Acceptable Manufacturers:

1 General Electric Co., Electrical Distribution & Control Division.

2 Siemens Energy & Automation, Inc.

3 Square D/Group Schneider.

4 Eaton Cutler-Hammer.

5 Pre-bid approved equal.

B Fusible Switch: NEMA KS 1, Type HD, quick-make, quick-break, dual-rated with electrical characteristics as required by the system voltage and the load served. Include clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C Nonfusible Switch: NEMA KS 1, Type HD, quick-make, quick-break, dual-rated with electrical characteristics as required by the system voltage and the load served. Include lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

2.02 MOLDED-CASE CIRCUIT BREAKERS

A Acceptable Manufacturers:

1 General Electric Co., Electrical Distribution & Control Division.

2 Siemens Energy & Automation, Inc.

3 Square D/Group Schneider.

4 Eaton Cutler-Hammer.

5 Pre-bid approved equal.

B Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1 Thermal-Magnetic Circuit Breakers: Inverse time-current 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.

2 Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3 Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a Instantaneous trip.

b Long- and short-time pickup levels.

c Long- and short-time time adjustments.

d Ground-fault pickup level, time delay, and I2t response.

4 GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

C Molded-Case Circuit-Breaker Features and Accessories:

1 Standard frame sizes, trip ratings, and number of poles.

2 Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.

3 Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.03 LOW-VOLTAGE AND CURRENT-LIMITING FUSES

A Conform to NEMA FU 1. Time delay and non-time delay options shall be as shown on the drawings.

B Provide equipment with a complete set of properly rated fuses when the equipment manufacturer utilizes fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed.

C Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage and shall have the time-current characteristics required for effective power system coordination.

D Cartridge Fuses: Cartridge fuses, current-limiting type, Class [G] [J] [K] [L] [RK1] [RK5] [RK9] [T] [CC] shall have tested interrupting capacity not less than 200,000 amperes. Fuse holders shall be the type that will reject Class H fuses.

1 Class [G] [J] [L] [CC] fuses shall conform to UL 198C.

2 Class K fuses shall conform to UL 198D.

3 Class R fuses shall conform to UL 198E.

4 Class T fuses shall conform to UL 198H.

E Transformer Circuit Fuses: Transformer circuit fuses shall be Class RK1 or RK5, current-limiting, time-delay with 200,000 amperes interrupting capacity.

2.04 ENCLOSURES

A NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1 Outdoor Locations: NEMA 250, Type 3R.

2 Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 EXECUTION

3.01 EXAMINATION

A Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

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

3.02 CONCRETE BASES

A Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B Concrete base is specified in Section 26 0529, Hangers and Supports for Electrical Systems, and concrete materials and installation requirements are specified in Division 03, Concrete.

3.03 INSTALLATION

A Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C Comply with mounting and anchoring requirements specified in Section 26 0529, Hangers and Supports for Electrical Systems.

D Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.04 IDENTIFICATION

A Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 0553, Identification for Electrical Systems.

B Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Section 26 0533, Raceway and Boxes for Electrical Systems.

3.05 FIELD QUALITY CONTROL

A Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B Prepare for acceptance testing as follows:

1 Inspect mechanical and electrical connections.

2 Verify switch and relay type and labeling verification.

3 Verify rating of installed fuses.

4 Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

C Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

1 Test mounting and anchorage devices according to requirements in Section 26 0529, Hangers and Supports for Electrical Systems.

2 Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

3 Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.06 ADJUSTING

A Set field-adjustable switches and circuit-breaker trip ranges.

3.07 CLEANING

A On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B Inspect exposed surfaces and repair damaged finishes.

END OF SECTION

26 3213

ENGINE GENERATOR

PART 1 GENERAL

1.1 DESCRIPTION

A This section includes the following items from a single supplier:

1 Engine Generator Set.

2 Enclosure

3 Related Accessories as specified

B Products Furnished or Supplied but not installed

C Products Installed but not furnished or supplied

D Related Requirements

1 It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.

2 Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.

3 It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.

4 All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

5 Generator to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

1.2 SUBMITTALS

A Action Submittals

1 Product Data

a The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

2 Shop Drawings

3 Samples

B Informational Submittal

1 Certificates

a The generator set shall be listed to UL 2200 or submitted to an independent third-party certification process to verify compliance as installed.

b The generator set shall be IBC Certified as meeting the required maximum seismic design acceleration level per the International Building Code 2000/2003 or 2006 for the specific job site. The generator shall be analyzed, or shake tested by a third party, accompanied by a Certificate of Compliance, and include a seismic label on the generator set (per Section 1702 of the IBC Code). Seismic certified generators shall be installed per the specific seismic instructions provided by the manufacturer.

2 Test and Evaluation Reports

3 Manufacturer's Instruction

4 Source Quality Control Submittals

5 Field or Site Quality Control

6 Manufacturer's Report

7 Special Procedure Submittal

8 Qualification Statement

C Closeout Submittal

1 Maintenance Contracts

2 Operation and Maintenance Data

3 Bonds

4 Warranty Documentation

5 Record Documentation

6 Software

D Maintenance Material Submittals

1.3 QUALITY ASSURANCE

A Regulatory Agency

1 The generator set shall conform to the requirements of the following codes and standards:

a CSA C22.2, No. 14-M91 Industrial Control Equipment.

b EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.

c EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

d IEC8528 part 4, Control Systems for Generator Sets.

e IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.

f IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

g NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

h NFPA 99, Essential Electrical Systems for Health Care Facilities.

i NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

2 Qualifications

a The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production, and service of its complete product line.

b The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

3 Manufacturers

a The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

4 Suppliers

5 Fabricators

6 Installers/Applicators/Erectors

7 Testing Agencies

8 Licensed Professional

9 Certificates

10 Preconstruction testing

11 Field and Site Samples

12 Mock-ups

1.4 FIELD OR SITE CONDITIONS

A Ambient Conditions

1 Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.

a Ambient Temperature: 77 degrees F

b Altitude : 500 feet

c Relative Humidity: 95 percent

PART 2 PRODUCTS

2.1 EQUIPMENT

A Equipment

1 The generator set shall be a Kohler model 230REOZJE with a 4UA9 alternator or equal. It shall provide 275 kVA and 220.00 kW when operating at 120/208 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130 degrees C Standby rating while operating in an ambient condition of less than or equal to 77 degrees F and a maximum elevation of 500 feet above sea level. The standby rating shall be available for the duration of the outage.

B Engine

1 The minimum 9 liter displacement engine shall deliver a minimum of 346 horsepower at a governed engine speed of 1800 rpm, and shall be equipped with the following:

a Electronic isochronous governor capable of 0.25 percent steady-state frequency regulation

b 24-volt positive-engagement solenoid shift-starting motor

c 60-ampere automatic battery charging alternator with a solid-state voltage regulation

d Generator engine block heater with built-in thermostat

e Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain

f Dry-type replaceable air cleaner elements for normal applications

g Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel

h The turbocharged engine shall be fueled by diesel

i The engine shall have a minimum of 6 cylinders and be liquid-cooled

2 The engine shall be EPA certified from the factory

3 The generator must accept rated load in one-step.

C Alternator

1 The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446, and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130 degrees C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid-state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability, and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5 percent total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

2 The alternator shall have a maintenance-free bearing, designed for 40000-hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

3 The generator shall be inherently capable of sustaining at least 300 percent of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

4 Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 960.00 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35 percent, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

D Vibration Isolation

1 Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

E Sound Attenuated Enclosure

1 Sound enclosure as required by local and state codes.

F Remote Annunciator Panel

1 Remote annunciator panel as required per NFPA 110. Panel to be located in electrical room, confirm exact panel location with owner.

2.2 SOURCE QUALITY CONTROL

A Non-Conforming Work

1 To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

a Design Prototype Tests. Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

1) Maximum power (kW)

2) Maximum motor starting (kVA) at 35 percent instantaneous voltage dip.

3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.

4) Governor speed regulation under steady-state and transient conditions.

5) Voltage regulation and generator transient response.

6) Harmonic analysis, voltage waveform deviation, and telephone influence factor.

7) Three-phase short circuit tests.

8) Alternator cooling air flow.

9) Torsional analysis to verify that the generator set is free of harmful torsional stresses.

10) Endurance testing.

b Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

1) Single-step load pickup

2) Safety shutdown device testing

3) Rated Power at 0.8 PF

4) Maximum power

5) Upon request, a witness test, or a certified test record sent prior to shipment.

c Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

1) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

2) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.

3) Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.

4) Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

B Non-Conforming Work

C Manufacturer’s Services

D Coordination of Other Tests and Inspections

PART 3 EXECUTION – NOT USED

END OF SECTION

26 3600

TRANSFER SWITCHES

PART 1 GENERAL

1.1 DESCRIPTION

A This section describes transfer switches rated 600 V and less, including the following:

1 Manual transfer switches.

1.2 REFERENCES

A NEMA: National Electrical Manufacturers Association

B NETA: International Electrical Testing Association

C UL: Underwriters Laboratories

1 UL 508: Industrial Control Equipment

1.3 SUBMITTALS

A Product Data: Submit for each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C Closeout Submittals: Provide operation and maintenance data.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A General:

1 The transfer switch, complete with all timers, relays, and accessories, shall be UL-listed under Standard UL 1008 and approved for use on emergency systems. The UL listing shall include the specific amperage ratings that are called for on the drawings.

2 Transfer switch to have seismic certification in accordance with ASCE 7-16, as required by OSSC 1705.13.

3 Contain a short circuit withstand capability and closing ratings when coordinated with circuit breakers more than the UL minimum requirement of 65,000 RMS amperes symmetrical.

4 Completely wired, assembled, and tested by the manufacturer at the factory to ensure compatibility and to completely test the assembly.

5 Provide the transfer switch as shown on the drawings with full load current rating of amperes at 120/208V, 3 phase, 4 wire, 60 Hertz AC normal and emergency.

6 Capable of switching all classes of load and rated for continuous duty when installed in non-ventilated enclosures.

7 Provide exercise timer, automatically actuated, to permit weekly programming of engine generator test runs under load. If the emergency source should fail during the exercise period, and if normal power is available, the switch shall immediately restore to normal.

8 Auxiliary contacts shall be provided to monitor the status of the ATS.

9 Microprocessor controlled with front accessible HMI interface.

10 Listed and rated as service equipment.

B Transfer Switch Construction:

1 Inherent 4 pole switched neutral type with all four poles on a common shaft.

2 Double-throw actuated by two electrical operators momentarily energized and connected to the transfer mechanism by a simple over center type linkage with a minimum transfer time of 400 MSEC. Provide an adjustable pneumatic timer, 0 to 60 seconds, on delayed equipment transfer switch.

3 Capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.

4 The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets, or springs and shall be silver tungsten alloy protected by arcing contacts with magnetic blowouts on each pole.

5 Equipped with safe manual operators that are designed to prevent injury to the operating personnel if the electrical operation should suddenly become energized during manual transfer. The manual operator shall provide the same contact transfer speed as the electrical operator to prevent a flashover caused by switching the main contacts too slowly.

6 Include pilot lights on the enclosure door to indicate the switch closed on normal or emergency, and four auxiliary contacts on the main shaft, two closed on normal, and two closed on emergency. Load test switch to simulate normal power failure. All relays, timers, control wiring, and accessories shall be front accessible.

7 Voltage Sensing: Provide the automatic transfer switch with voltage sensing relays for each phase. Connection of these sensing relays shall be made to the normal power input terminals of the transfer switch. Voltage range shall be field adjustable.

8 Include a two-position selector switch to select either automatic or manual transfer operation with pushbuttons to transfer to emergency and re-transfer to normal.

C Install each automatic transfer switch in an enclosure with locking hinged door conforming to NEMA ICS and complying with the requirements of UL 508.

D Main terminals requiring field wiring connections shall be suitable for copper wiring.

E Automatic transfer switches shall be suitable for satisfactory performance when installed for operation at 200-feet altitude, 40 degrees C high and minus 20 degrees C low ambient temperature, 90 percent relative humidity.

F Color of the finish coat of paint shall be manufacturer’s standard.

G Acceptable manufacturer is Russelectric “RMTD” type, or equal.

2.2 MANUAL TRANSFER SWITCH

A Operation: Electrically actuated by push buttons designated “Normal Source” and “Alternate Source.” Switch shall be capable of transferring load in either direction with either or both sources energized.

B Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

C Nonautomatic Transfer-Switch Accessories:

1 Pilot Lights: Indicate source to which load is connected.

2 Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternate-source sensing circuits.

a Normal Power Supervision: Green light with nameplate engraved “Normal Source Available.”

b Emergency Power Supervision: Red light with nameplate engraved “Alternate Source Available.”

D Transfer Switch Construction:

1 Capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.

2 The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets, or springs and shall be silver tungsten alloy protected by arcing contacts with magnetic blowouts on each pole.

3 Equipped with safe manual operators that are designed to prevent injury to the operating personnel if the electrical operation should suddenly become energized during manual transfer. The manual operator shall provide the same contact transfer speed as the electrical operator to prevent a flashover caused by switching the main contacts too slowly.

E Install each manual transfer switch in an enclosure with locking hinged door conforming to NEMA ICS and complying with the requirements of UL 508.

F Main terminals requiring field wiring connections shall be suitable for copper wiring.

G Color of the finish coat of paint shall be manufacturer’s standard.

H Acceptable manufacturer is Russelectric “RMTD” type, ASCO or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A Neatly lace and secure the conductors of the feeder circuits individually at maximum 2-foot intervals. The cable lugs shall not support the weight of the cables.

B Identify components according to Section 26 0533, Raceway and Boxes for Electrical Systems.

C Manual Transfer Switch: Install automatic transfer switch as shown on the drawings and according to the manufacturer’s recommendations.

D Concrete Pads: Provide minimum 3-inch-thick concrete housekeeping pads under all free-standing pieces of switchgear. Extend pads a minimum of 2 inches beyond the edges of the equipment.

3.2 STARTUP, TESTING, AND TRAINING

A Comply with NETA standards.

B Perform startup and testing of the equipment after installation has been completed.

C Testing:

1 Fully test switch operation. Tests shall be witnessed by the Owner.

D Upon completion of the onsite tests, a general inspection shall be made for any deficiency which may impair proper operation.

3.3 ACCEPTANCE

A Final acceptance will not be granted by the Owner until onsite tests have been successfully completed, all defects in material or operation have been corrected, and operating and maintenance data has been submitted along with all completed test reports.

END OF SECTION

26 5000

LIGHTING

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes specific lighting requirements.

1.02 REFERENCES

A ANSI: American National Standards Institute

1 ANSI C62.41: Surge Voltages in Low-Voltage AC Power Circuits

2 ANSI C82.2: Methods of Measurement of Fluorescent Lamp Ballasts

3 ANSI C82.11: High-Frequency Fluorescent Lamp Ballasts

B FCC: Federal Communications Commission

1 FCC Part 18: Industrial, Scientific, and Medical Equipment

C UL: Underwriters Laboratories

1 UL 935: Standard for Fluorescent-Lamp Ballasts

1.03 SUBMITTALS

A “Pre-Bid Approved Equal” Submittal Requirements:

1 To be considered, submit the following specific information and product samples:

a A sample of each type of proposed luminaire, identical in construction and ratings to that specified.

b Complete photometric data, including coefficient of utilization curve, isofootcandle curves, and distribution data in tabular form for each type of luminaire proposed.

c Ballast data, including manufacturer’s name, model number, wiring diagram, lamp type and watts for which the unit is capable of operating, power factor and current crest factor.

2 Equality shall be determined by the following luminaire characteristics:

a Performance:

1) Distribution.

2) Utilization.

3) Average brightness/maximum brightness.

4) Spacing to mounting height ratio.

5) Visual comfort probability.

b Construction:

1) Engineering.

2) Workmanship.

3) Rigidity.

4) Permanence of materials and finishes.

c Installation Ease:

1) Captive parts and captive hardware.
2) Provision for leveling.
3) Through-wiring ease.

d Maintenance:

1) Relamping ease.
2) Replacement of ballast and lamp sockets.

e Appearance:

1) Light tightness.
2) Neat, trim styling.

B Submit the following contract submittal requirements:

1 Shop drawings.

2 Product data.

3 Photometric reports that include:

a Candlepower distribution curves.

b Coefficient of utilization table.

c Zonal lumen summary.

d Certification of lamp ballast compatibility.

e Operation and maintenance data.

f Operational sample upon request.

PART 2 PRODUCTS

2.01 MATERIALS

A Recessed luminaires shall have trims that fit neatly and tightly to the surfaces on which they are installed, without leaks or gaps. Where necessary, install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires' trim and the surface to which they are mounted.

B Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations shall be UL listed and labeled as suitable for damp or wet locations.

C Aligners shall be ball type with nominally 45-degree movement either side of center. Provide white stem aligner canopies where installed in finished areas.

D Luminaires shall be new and complete with mounting accessories, junction boxes, wiring whips, trims, and lamps.

2.02 FIXTURE LIST

A See Fixture Schedule on drawing E-6.02 for complete fixture list.

2.03 POLES AND STANDARDS

A Steel Poles:

1 Poles shall be round or octagonal area tapered, minimum 11-gauge steel with a minimum 8-inch diameter base.

2 Poles shall be supplied with a minimum 3-inch x 5-inch reinforced handhole with a removable cover.

3 Welded seams or joints which will be visible after complete installation shall be ground so that they will not be noticeable after galvanizing.

4 Luminaire mounting height shall be as shown on the drawings. Verify pole height for each location to maintain the proper mounting height.

5 Poles shall be designed to withstand 100 mph continuous wind with 1.25 gust factor without failure or permanent deformation. Pole wind load design shall be based on pole installed with the specified luminaires, mounting brackets, and obstruction light.

6 Each pole assembly shall include four anchor bolts (each with leveling nut, anchor nut, and washers), galvanized after threading. Bolt size and length shall be as required to withstand design loads. Anchor bolts shall be provided for pole base attachment to a structural steel plate. Coordinate anchor bolt requirements with structural provisions.

7 Poles and mounting brackets shall be hot dip galvanized after fabrication.

8 Provide reinforced pole mounting brackets for floodlight luminaires 180 degrees apart. Mounting brackets shall accommodate specified luminaire mounting requirements and accommodate wiring internally.

9 Provide means to support all pole riser wiring without depending on the luminaire attachments.

10 Submittals for approval of poles shall include calculations to demonstrate that complete structure will meet the continuous gust wind loading criteria and shall include complete shop drawings of the poles with specified reinforcements and handholes in detail.

11 Manufacturer: OldCastle 7-LB or equal.

2.04 SITE LIGHTING FIXTURES

A Manufacturer: See Fixture Schedule on drawing E-6.02 for manufacturer (or equal) and site lighting characteristics.

PART 3 EXECUTION

3.01 INSTALLATION

A Luminaires shall be assembled and installed according to the manufacturers' instructions, the drawings, and these specifications.

B After installation, the units shall be clean and lamped with the specified lamp.

C Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

D Wear gloves for installation of parabolic reflectors to leave luminaires clean and with every lamp in operation at the time of acceptance. If luminaires are deemed dirty at completion of the work, the Contractor shall clean them at no additional cost.

E Level luminaires, align in straight lines, and locate as shown on the drawings. The final decision as to adequacy of support and alignment will be given by the Port. The fixtures shall

be supported by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.

F Aim luminaires to provide the lighting pattern for which the luminaire is designed and as directed.

G Manufacturer's labels or monograms shall not be visible after luminaire is installed but shall be included for future reference.

3.02 POLES AND STANDARDS INSTALLATION

A The pole foundation is shown on the drawings. At some locations, excavation may reveal subsurface conditions or utilities which preclude use of the standard design. Each such location will be dealt with as it is found, at the direction of the Owner.

B After setting foundation or wood pole in place, backfill with non-shrink grout or concrete as applicable so that the pole will be virtually installed in undisturbed soil.

C Verify, before assembly of poles and luminaires, that exterior finishes are not chipped or otherwise marred.

D Pole sections shall be assembled per manufacturer's recommendations.

E Poles and luminaires shall be completely assembled and wired before erection.

F Steel Pole Erection:

1 Set leveling nuts on anchor bolts with enough freedom to permit leveling of pole.

2 Raise pole and set on anchor bolts without slinging. Set anchor nuts only finger tight before leveling.

3 Level base plates by adjusting nut pairs until pole is vertical, then tighten anchor nuts securely while ensuring that pole remains vertical. Install anchor bolt/baseplate cover, if used.

4 Make wiring splices in handhole, dress wiring, and install handhole cover.

G Grout baseplate to enclose levelling nuts, with a 45-degree bevel outside fillet between baseplate and foundation. Provide a drainway, using an easily removable blockout plug, to allow condensed moisture to drain from pole interior.

3.03 FIRE RATING COVER

A Provide protective coverings for all luminaires recessed in fire-rated ceilings. Covering materials shall provide a UL-listed, one-hour fire rating assembly.

B Coordinate locations from the drawings.

C Luminaires shall be listed for use in fire-rated cover.

3.04 TESTING

A Lighting circuits shall be tested and meet the requirements as specified in Section 26 0500, Common Work Results for Electrical.

B Lighting systems shall be operationally tested. Utilize a light meter to confirm that light levels agree favorably with the design, which was based on the luminaire specified.

C Should results prove unacceptable and cause is attributed to the Contractor, the costs of corrections and subsequent additional testing shall be the Contractor's responsibility.

END OF SECTION

28 0513

CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 DESCRIPTION

A This section describes:

1 Low-voltage control cabling.

2 Control-circuit conductors.

3 Fire alarm wire and cable.

1.02 REFERENCES

A BICSI: Building Industry Consulting Service International

1 BICSI ITSIM Ch. 4: Pulling Cable

2 BICSI ITSIM Ch. 6: Cable Termination Practices

B NECA: National Electrical Contractors Association

1 NECA 1: Standard Practice of Good Workmanship in Electrical Construction

C NEMA: National Electrical Manufacturers Association

1 NEMA 250: Enclosures for Electrical Equipment (1000 Volts Max)

D NFPA: National Fire Protection Association

1 NFPA 70: National Electric Code

2 NFPA 72: National Fire Alarm and Signaling Code

3 NFPA 262: Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces

E TIA: Telecommunications Industry Association

1 TIA 568-B.1: Minimum 4-Pair Sc-TP Patch Cable Bend Radius

F UL: Underwriters Laboratories:

1 UL 83: Thermoplastic-Insulated Wires and Cables

2 UL 1581: Reference Standard for Electrical Wires, Cables, and Flexible Cords

3 UL 1655: Standard for Community-Antenna Television Cables

4 UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

1.03 SUBMITTALS

A Submit the following materials:

1 Product Data: Submit for each type of product indicated.

2 For coaxial cable, submit the following installation data for each type used:

a Nominal OD.

b Minimum bending radius.

c Maximum pulling tension.

3 Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

4 Maintenance Data: For wire and cable to include in maintenance manuals.

5 Cable test data per testing requirements of Part 3.

1.04 PROJECT CONDITIONS

A Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A Acceptable manufacturers:

1 Belden CDT Inc., Electronics Division.

2 West Penn Wire/CDT, a division of Cable Design Technologies.

3 Or equal.

2.02 LOW-VOLTAGE CONTROL CABLE

A Paired Cable: NFPA 70, Type CMG.

1 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.

2 PVC insulation.

3 Unshielded.

4 PVC jacket.

5 Flame Resistance: Comply with UL 1581.

B Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.

2 PVC insulation.

3 Unshielded.

4 PVC jacket.

5 Flame Resistance: Comply with NFPA 262.

C Paired Cable: NFPA 70, Type CMG.

1 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.

2 PVC insulation.

3 Unshielded.

4 PVC jacket.

5 Flame Resistance: Comply with UL 1581.

D Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.

2 Fluorinated ethylene propylene insulation.

3 Unshielded.

4 Plastic jacket.

5 Flame Resistance: NFPA 262, Flame Test.

2.03 CONTROL-CIRCUIT CONDUCTORS

A Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.

B Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.

C Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.04 FIRE ALARM WIRE AND CABLE

A General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

B Initiating Device Circuits: Twisted, unshielded pair, No. 16 AWG size as recommended by system manufacturer.

C Speaker Circuits: Twisted, shielded pair, No. 14 AWG size as recommended by system manufacturer.

D Strobe Circuits: No. 12 AWG THHN, red indicating positive and black indicating negative.

E Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 C, color-coded insulation.

1 Low-Voltage Circuits: No. 14 AWG, minimum.

2 Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 EXECUTION

3.01 INSTALLATION OF CONDUCTORS AND CABLES

A Comply with NECA 1.

B General Requirements for Cabling:

1 Comply with TIA-568-B.1.

2 Comply with BICSI ITSIM, Ch. 6, “Cable Termination Practices.”

3 Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated terminals.

4 Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

5 Bundle, lace, and train conductors to terminal points without exceeding manufacturer’s limitations on bending radii, but not less than radii specified in BICSI ITSIM, “Cabling Termination Practices” Chapter. Install lacing bars and distribution spools.

6 Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.

7 Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

8 Pulling Cable: Comply with BICSI ITSIM, Ch. 4, “Pulling Cable.” Monitor cable pull tensions.

C Pulling wire and cable into conduit or trays shall be completed without damaging or putting undue stress on the cable insulation. UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Raceway construction shall be complete, cleaned, and protected from the weather before cable is placed.

D Separation from EMI Sources:

1 Separation between cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.

b Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

c Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

2 Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

b Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

3 Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a Electrical Equipment Rating Less Than 2 kVA: No requirement.

b Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

c Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

4 Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

5 Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.02 FIRE ALARM WIRING INSTALLATION

A Comply with NECA 1 and NFPA 72.

B Wiring Method: Install wiring in metal raceway according to Section 26 0533, Raceway and Boxes for Electrical Systems.

1 Install plenum cable in environmental air spaces, including plenum ceilings.

2 Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

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 the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D 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.

3.03 CONTROL-CIRCUIT CONDUCTORS

A Minimum Conductor Sizes:

1 Class 1 remote-control and signal circuits, No. 14 AWG.

2 Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.

3 Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.04 FIRESTOPPING

A Comply with requirements in Division 7, Firestopping.

3.05 GROUNDING

A For low-voltage wiring and cabling, comply with requirements in Section 26 0526, Grounding and Bonding for Electrical Systems.

3.06 IDENTIFICATION

A Comply with requirements for identification specified in Section 26 0553, Identification for Electrical Systems.

3.07 FIELD QUALITY CONTROL

A Perform tests and inspections.

1 Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding.

2 Visually inspect cable placement, cable termination, grounding and bonding, equipment, and labeling of all components.

3 Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination.

a Instruments used for continuity measurements shall have a resolution of 0.1 ohms and an accuracy of better than 0.1 percent of reading plus 0.3 ohms. A 500-volt megohmmeter shall be used for insulation resistance measurements.

4 Coaxial Cable Tests: Comply with requirements of TIA testing practices and procedures.

B Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.

C End-to-end cabling will be considered defective if it does not pass tests and inspections.

D Prepare test and inspection reports.

END OF SECTION

28 4600

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 DESCRIPTION

A Provide expansion and modifications to the existing fire alarm system. Performance of the system modifications shall meet all performance aspects of the requirements stated within these specifications or shown on the drawings.

1.02 REFERENCES

A Abbreviations and Acronyms:

1 ADA: Americans with Disabilities Act

2 AHJ: Authority Having Jurisdiction

3 EOL: End of Line

4 FAAP: Fire Alarm Annunciator Panel

5 FACU: Fire Alarm Control Panel

6 FASSP: Fire Alarm System Service Provider

7 HVAC: Heating Ventilating and Air Conditioning

8 NAC: Notification Appliance Circuit

9 NRTL: Nationally Recognized Testing Laboratory

B References:

1 ANSI: American National Standards Institute

2 FCC: Federal Communications Commission

a FCC Part 15: Radio Frequency Devices

3 ISO: International Organization for Standardization

4 NICET: National Institute for Certification in Engineering Technologies

5 NFPA: National Fire Protection Association

a NFPA 3: Standard for Commissioning of Fire Protection and Life Safety Systems

b NFPA 70: National Electrical Code

c NFPA 72: National Fire Alarm and Signaling Code

d NFPA 101: Life Safety Code

e NFPA 170: Standard for Fire Safety and Emergency Symbols

6 UL: Underwriters Laboratories

a UL 268: Smoke Detectors for Fire Alarm systems

b UL 864: Standard for Control Units and Accessories for Fire Alarm Systems

1.03 SYSTEM DESIGN REQUIREMENTS

A The contract documents indicate the general nature or requirements of the fire alarm system, but do not necessarily show all components required. The Contractor shall provide a complete fire alarm system design and installation, as required, to meet applicable codes and requirements under this section. The system shall consist of, but not be limited to the following components as required:

1 UL-listed, electrically operated and supervised, stand-alone fire alarm control panel.

2 Remote booster power supplies, as required, to minimize NAC voltage drop.

3 Voice evacuation amplifiers to interface with speakers.

4 Manual pull stations at all building exits.

5 Single-coil fire alarm speakers.

6 Audible/visual alarm devices.

7 Smoke and Heat Detectors:

a Smoke detection shall be provided in accordance with NFPA 72 requirements. In addition, smoke detection shall be provided at ducts and at the ceiling in all new spaces and rooms or where indicated on the drawings.

b Heat detectors shall be provided in areas where smoke detection is not appropriate due to ambient and environmental conditions.

8 Monitor modules, installed in a fail-safe manner, required to power and/or interconnect devices supplied under other divisions, including but not limited to:

a Elevator shunt trip power.

b Monitor end switches (if applicable) or status of HVAC dampers after activation.

c Fire suppression supervisory and flow switches.

9 Control modules required to power and/or interconnect devices supplied under other divisions, including but not limited to:

a Elevators for recall operation and power shutdown.

b HVAC system to shut down air handling units.

c HVAC system to release fire/smoke dampers.

d Interrupt power to magnetic locks at emergency exits.

10 Conduit and cabling.

1.04 SUBMITTALS

A Product Data: Provide a bill of materials for all products utilized. For each type of product, including furnished options and accessories.

1 Include construction details, material descriptions, dimensions, profiles, and finishes.

2 Include rated capacities, operating characteristics, and electrical characteristics.

B Fire Alarm Shop Drawings:

1 Prepare shop drawings of the system design utilizing AutoCAD with standard fire alarm legend and current project backgrounds.

2 Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.

3 Shop drawings shall indicate, but not be limited to, the following:

a Floor plans to indicate fire alarm devices and equipment locations. Show address of all addressable devices, size and route of cable and conduits, and point-to-point wiring diagrams. Floor plans shall be legible and drawn at a scale of 1/8 inch = 1 foot – 0 inch minimum.

b Schematic and riser diagrams.

c Voice/alarm signaling-service equipment amplifier power calculation and single-line connection diagram.

d Include calculations for determining the requirements for:

1) Spacing and sensitivity of detectors.

2) Spacing and intensities for strobe signals and sound-pressure levels for audible appliances.

3) Voltage drop for NACs: Provide actual voltage measurements as a basis of calculating voltage drop on existing NACs.

4) Battery sizing.

e Sequence of operation in the form of a cross-functional matrix describing all programed functions.

4 Shop drawings shall be prepared by persons with the following qualifications:

a Trained and certified by manufacturer in fire alarm system design.

b NICET Level IV Fire Alarm certified engineering technician.

C Provide a fully populated fire alarm device schedule.

D Example test plans and forms describing all hardware and software validation test methods and procedures.

1.05 CODES AND APPROVALS

A Obtain necessary approvals from local authorities for materials to be supplied, methods of installation, and system operations as required herein and by the local authorities.

B All electronic equipment shall conform to the requirements of FCC regulation Part 15, Section 15 governing radio frequency electromagnetic interference and be so labeled.

1.06 QUALITY ASSURANCE

A All components shall be listed by a qualified testing agency both in individual components and as a system and installed in accordance with NFPA and OSSC requirements.

B Installation shall be supervised or installed by personnel with a minimum NICET Level 2 certification. Personnel shall be trained and certified by and in good standing with the manufacturer.

C NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

PART 2 PRODUCTS

2.01 GENERAL

A All fire alarm system components furnished under this contract shall be fully addressable and compatible with the existing fire alarm system.

2.02 FIRE ALARM CONTROL PANEL (FACU)

A The FACU shall be on a Guardian Security or approved equal platform, no substitutions. The FACU shall include the following options:

1 Central Processor.

2 Display Module.

a In addition to the standard control switches, provide Setup, Test, Manual Evacuation Alarm, and Acknowledge switches. Provide LEDs for “Power,” “Run,” “Trouble,” “Disconnect,” “Low Battery,” and “Ground Fault.”

3 Control Display Module.

4 Power Supplies.

5 Signature Driver Controllers.

6 Network communications card.

7 Maintenance-free, sealed lead acid batteries with adequate capacity to provide the indicated operation.

B Provide an alarm silence switch in the FACU to override the piezo alarm while conducting testing and inspection services. Switch in silence position shall be monitored as a trouble alarm.

C Enclosure:

1 Visual indicators of FACU status shall be visible without opening the key-locked cover.

2 Locks: BHMA A156.11, E07121. Lock cylinders and keying where noted:

3 Equip locks with cylinders with full size interchangeable core pin tumbler inserts.

2.03 FIRE ALARM ANNUNCIATOR PANEL (FAAP)

A Description: Remote annunciator functions shall match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

B Mounting: Flush cabinet, NEMA 250, Type 1.

C Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

D Enclosure:

1 Visual indicators of FACU status shall be visible without opening the key-locked cover.

2 Locks: BHMA A156.11, E07121. Lock cylinders and keying where noted:

3 Equip locks with cylinders with full size interchangeable core pin tumbler inserts.

2.04 INITIATING DEVICES – DETECTORS

A Multicriteria Smoke Detector:

1 Smoke Detector.

2 Duct Smoke Detector.

B Heat Detector:

1 Fixed Temperature.

2 Rate of Rise Temperature.

C Detector Bases:

1 Standard Base.

2 Detector Base with Isolator.

D Beam-Type Smoke Detectors:

1 Provide projected beam-type smoke detectors. The beam detectors shall be four-wire 24 VDC and powered from the control panel four-wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 feet or a long range of 100 to 300 feet. The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools.

2 The beam detector shall feature automatic gain control that compensates for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the drawings. Testing shall be carried out using calibrated test filters. Provide a key-activated remote test station.

3 Provide monitor modules for alarm and trouble and control relay module for reset.

2.05 MANUAL PULL STATIONS

A Intelligent, Single Action Pull Station.

B Intelligent, Double Action Pull Station.

2.06 NOTIFICATION APPLIANCES

A All notification appliances which are supplied for the requirements of this specification shall be UL-listed for fire protective service and shall be capable of providing the “Equivalent Facilitation,” which is allowed under the Americans with Disabilities Act Accessibility Guidelines (ADA[AG]) and shall be UL 1971 and ULC S526-listed.

B Remote Booster Power Supplies:

1 Inputs:

a 120VAC with built-in battery charger and sealed lead acid, gel, or AGM type backup battery.

b Capable of 2 Class A or 2 Class B NACs.

2 Outputs:

a Capable of 4 Class B or 2 Class A NACs. NAC outputs shall be 24VDC, 3 amps, power limited.

3 Supervision:

a Compatible with 12V or 24V FACU.

b Automatic switchover to standby battery when AC fails.

c Thermal and short-circuit protection with auto reset.

d AC fail, battery presence and low battery conditions.

4 Enclosure:

a Minimum 14-gauge steel.

b Locks: BHMA A156.11, E07121. Lock cylinders and keying where noted:

c Equip locks with cylinders with full size interchangeable core pin tumbler inserts.

C Self-Synchronized Strobes:

1 Characteristics: The strobe housing shall be white with red lettering. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. Strobes shall have lens markings oriented for wall mounting. Ceiling-mounted strobes shall have lens markings with correctly oriented lettering.

D Speakers:

1 Characteristics: Speaker housings shall be white.

E Speaker/ Strobes:

1 Characteristics: Speaker/strobes housing shall be white with red lettering. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. The strobe shall have lens markings oriented for wall mounting. Ceiling-mounted speaker/strobes shall have lens markings with correctly oriented lettering. Removal of an installed speaker/strobe to change the lens markings will not be acceptable.

2.07 AUDIO AMPLIFIERS

A 40 Watt Zoned Amplifier w/Class A/B

B 95 Watt Zoned Amplifier w/Class A/B

PART 3 EXECUTION

3.01 GENERAL

A Work shall be performed in accordance with the requirements of NFPA 70 and NFPA 72.

B Systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems may be installed within a common conduit raceway system, in accordance with the manufacture’s recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

C No wiring except life safety system circuits and system power supply circuits shall be permitted in the FACU enclosures.

D Devices containing end-of-line resistors shall be appropriately labeled. Devices shall be labeled such that removal of the device is not required to identify the EOL device.

3.02 INSTALLATION OF FIRE ALARM COMPONENTS

A Devices and appliances shall be mounted to or in an approved electrical box.

B FACUs, FAAPs , and Remote Booster Power Supplies:

1 Mount the FACU enclosure with the top of the cabinet 72 inches above the finished floor or center the cabinet at 63 inches, whichever is lower. The FACU shall be installed in accordance with the manufacturer’s guide for seismic applications.

2 Paint the handles of the dedicated circuit breakers feeding fire alarm panels red and install handle locks.

3 Within the panel, non-power limited wiring shall be properly separated from power limited circuits.

C Manual Pull Stations:

1 Mount stations so that their operating handles are between 42 inches and 48 inches above the finished floor.

D Notification Appliances:

1 Wall-mounted audio/visual devices shall be mounted so the entire lens is between 80 inches and 96 inches above the finished floor unless otherwise indicated on drawings.

2 Each speaker/strobe's outputs shall be set to the wattage/candela value indicated for its specific location as shown on the drawings.

E Smoke Detectors:

1 Smoke and heat detector heads shall not be installed until after construction clean-up is completed. Detector heads installed prior to construction clean-up shall be cleaned by the manufacturer or replaced.

2 Detectors located on the wall shall have the top of the detector at least 4 inches and not more than 12 inches below the ceiling.

3 Install smoke detectors no closer than 3 feet from air handling supply air diffusers or return air openings.

4 Locate detectors no closer than 12 inches from any part of a lighting fixture.

F Duct Smoke Detectors:

1 Install sampling tubes so they extend the full width of ducts exceeding 36 inches.

2 Detectors shall be located to facilitate ease of maintenance.

3 All penetrations near detectors located on/in return ducts shall be sealed to prevent air entry.

G Remote Status and Alarm Indicators:

1 Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H Beam Smoke Detectors:

1 Install beam type smoke detectors in accordance with the shop drawings and the manufacturer's recommendations.

2 Keep the centerline of the beam a minimum of 24 inches from obstructions.

3 Mount where accessible for maintenance.

I Heat Detectors:

1 Heat detectors shall be installed in strict accordance with their UL listing, the requirements of NFPA 72 and applicable manufacturer's recommendations.

J Control Modules:

1 Install the module within 3 feet from the device controlled.

2 Orient the device mounting for best maintenance access.

3 Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads (auxiliary relays, door holders). Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.

K Signaling Line Circuits:

1 FACU and FireWorks Network shall utilize NFPA 72 Class A wiring methods. Refer to Section 271000 for communication cabling requirements.

2 NACs shall be supervised and power limited. NACs shall utilize Class B wiring methods unless otherwise indicated. Initial circuit loading shall not exceed 70 percent to allow for future system expansion. An NAC expander output shall not be used to initiate another NAC expander.

3 Initiating device circuits shall utilize NFPA 72 Class B wiring methods. Initiating device circuits shall be configurable for latched or non-latched operation and configurable to initiate alarm, supervisory, or monitor events.

4 No t-taps or wire nut connections will be allowed. Terminations shall be made directly on the fire alarm device terminals. Connections shall be made directly to and from device terminal screws. Screw terminals shall have rising plates to terminate more than one wire, or each wire shall be terminated to individual screws or in a ring lug.

3.03 TRAINING

A Provide operation and maintenance training.

B Training sessions shall be given by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

3.04 TESTING AND REPORTS

A Upon completion of the system's installation, an approved representative of the system manufacturer shall be employed to conduct a thorough test of the system in accordance with NFPA 3 and NFPA 72 requirements.

B Exercise every function of the equipment during the test to ascertain the integrity of the equipment. Testing shall include verification of the following:

1 The functional operation of each resettable initiating device (manual stations, detectors, etc.) and circuit.

2 The functional operation of every alarm device and circuit.

3 The functional operation of each monitored device circuit.

4 The supervision function of each supply circuit, initiating device, notification appliance, monitoring, and control.

C Verify as-constructed drawings are accurate.

D If the tests are not successful in the first pass, correct deficiencies, and resume testing.

E Document and maintain in a problem log, all file discrepancies found during testing. Describe the subsequent correction.

END OF SECTION

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 1000 - Summary: Sequencing and staging requirements.

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

D. Section 01 5713 - Temporary Erosion and Sediment Control.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

G. Section 02 4100 - Demolition: Removal of built elements and utilities.

H. Section 31 2200 - Grading: Topsoil removal.

I. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

J. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

K. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

L. Section 32 9300 - Plants: Relocation of existing trees, shrubs, and other plants.

1.03 SUBMITTALS

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

B. Site Plan: Showing:

1. Areas for temporary construction and field offices.

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2323 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

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

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

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. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structures and paving.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the limits indicated on drawings.

D. Install substantial, highly visible fences at least 3 feet (1 m) high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.
   4. See Section 01 5000 for fence construction requirements.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches (450 mm).
   3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches (450 mm).
   4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

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 31 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading the site for site structures, building pads, and paving .

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

B. Section 31 2316 - Excavation.

C. Section 31 2316.13 - Trenching: Trenching and backfilling for utilities.

D. Section 31 2316.26 - Rock Removal.

E. Section 31 2323 - Fill: Filling and compaction.

F. Section 32 9219 - Seeding: Finish ground cover.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Oregon, Highway Department standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 2323.

B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

G. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 2323 for filling procedures.

G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

H. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet (2.5 m); protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

E. Lightly compact placed topsoil.

F. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Investigation performed by PBS, dated August 26,2020: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 5713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 01 7000 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.

D. Section 31 2200 - Grading: Soil removal from surface of site.

E. Section 31 2200 - Grading: Grading.

F. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

G. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.

H. Section 31 2323 - Fill: Fill materials, filling, and compacting.

I. Section 31 3700 - Riprap.

1.03 SUBMITTALS

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

B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.04 PROJECT CONDITIONS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer.

3.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard (0.25 cu m) measured by volume. See Section 31 2316.26 for removal of larger material.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

I. Provide temporary means and methods, as required, to remove all water from excavations until directed by the Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer. If the proposed excavation extends more than 1 foot (305 mm) into the excavation, control groundwater intrusion with a comprehensive dewatering procedure, or as directed by the Geotechnical Engineer.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site

M. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load bearing excavated surfaces before placement of foundations.

3.05 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2316.13

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building septic lagoon, wells, stormwater faciliities, etc..

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Investigation performed by GRI dated August 17,2018: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Building and foundation excavating.

E. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.

F. Section 31 2323 - Fill: Backfilling at building and foundations.

G. Section 33 4100 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.05 SUBMITTALS

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

B. Materials Sources: Submit name of imported materials source.

C. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type Dense-Graded Aggregate: Subsoil excavated on-site.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer.

3.03 TRENCHING

A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard (0.25 cu m) measured by volume.

H. Remove excavated material that is unsuitable for re-use from site.

I. Remove excess excavated material from site.

J. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

K. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches (150 mm) compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

G. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping and Conduits:
   1. Bedding: Use general fill.
   2. Cover with general fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

C. At Pipe Culverts:
   1. Bedding: Use general fill.
   2. Place filter fabric specified in Section 33 0513 over compacted bedding.
   3. Cover with general fill.
   4. Fill up to subgrade elevation.
   5. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 2323

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Investigation performed by PBS dated August 26,2020: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 5713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 03 3000 - Cast-in-Place Concrete.

D. Section 13 4713 - Cathodic Protection.

E. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

F. Section 31 2200 - Grading: Site grading.

G. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

H. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

I. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.

J. Section 31 3700 - Riprap.

K. Section 32 1423 - Asphalt Unit Paving: Leveling bed placement under pavers.

L. Section 33 4100 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017.

J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.05 SUBMITTALS

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

B. Product Data for Manufactured Fill.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

D. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Borrow Fill - Conforming to 2018 State of Oregon Highway Department Standard Specifications 00330.12 – Borrow Material.

B. Select Granular Fill - Conforming to 2018 State of Oregon Highway Department Standard Specifications 00330.14 – Selected Granular Backfill.

C. Crushed Aggregate Base - Conforming to 2018 State of Oregon Highway Department Standard Specifications 02630.10- Dense-Graded Aggregate.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

D. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 2200 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

F. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

G. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches (150 mm) compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At other locations: 95 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.06 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 3700
RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap .

1.02 RELATED REQUIREMENTS

A. Section 31 2323 - Fill: Aggregate requirements.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with State of Oregon Highways standard.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Class 50 riprap conforming to 00390.11 of the 2018 Standard Specifications for Construction

B. Geotextile Fabric: Meeting the requirements of 02320 of the 2018 Standard Specifications for Construction

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes and as indicated.

3.03 SCHEDULES

A. Culvert Pipe Ends: Bagged, placed one layer thick, 6 inch (150 mm) average thickness, concealed with topsoil fill.

END OF SECTION

SECTION 32 1123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for base course.

B. Section 31 2316.13 - Trenching: Compacted fill over utility trenches under base course.

C. Section 31 2323 - Fill: Topsoil fill at areas adjacent to aggregate base course.

D. Section 31 2323 - Fill: Compacted fill under base course.

E. Section 32 1216 - Asphalt Paving: Finish and binder asphalt courses.

F. Section 32 1313 - Concrete Paving: Finish concrete surface course.

G. Section 33 0513 - Manholes and Structures: Manholes including frames.

H. Section 33 4100 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017.

J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.04 SUBMITTALS

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

B. Materials Sources: Submit name of imported materials source.

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate where indicated on drawings.

C. When aggregate materials need to be stored on site, locate where directed by Owner.

D. Aggregate Storage, General:
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dense-Graded Aggregate conforming to section 02630.10 of the 2018 Oregon Standard Specification for Construction.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Under Bituminous Concrete Paving:
   1. Place coarse aggregate to a total compacted thickness of 18 inches.
   2. Compact to 95 percent of maximum dry density.

B. Place aggregate in maximum 4 inch (100 mm) layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6.4 mm) measured with 10 foot (3 m) straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch (6.4 mm).

C. Variation From Design Elevation: Within 1/2 inch (12.8 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.
B. Single course bituminous concrete paving.
C. Double course bituminous concrete paving.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting: Pavement markings.
B. Section 31 2200 - Grading: Preparation of site for paving and base.
C. Section 31 2323 - Fill: Compacted subgrade for paving.
D. Section 32 1123 - Aggregate Base Courses: Aggregate base course.
E. Section 32 1313 - Concrete Paving: Concrete curbs.
F. Section 32 1713 - Parking Bumpers: Concrete bumpers.
G. Section 32 1723.13 - Painted Pavement Markings: Concrete bumpers.
H. Section 33 0513 - Manholes and Structures: Manholes, including frames; gutter drainage grilles, covers, and frames for placement by this section.

1.03 REFERENCE STANDARDS

A. Provide design that meets Section 00744 of the 2018 ODOT Standard Specifications modified as follows:

~~AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 2015.~~

~~B. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.~~

00744.11(a) Asphalt Cement - Add the following to the end of this subsection:

Provide PG64-28 grade asphalt cement for this Project.

00744.16 Sampling and Testing - Replace this subsection, except for the subsection number and title, with the following:

For each 1,000 tons of placement, have a CAT I perform a minimum of one of each of the following test methods as modified in the MFTP:

- Asphalt Content - AASHTO T 308 with ODOT TM 323 determined Calibration Factor
- Gradation - AASHTO T 30
- Mix Moisture - AASHTO T 329
- Maximum Specific Gravity - AASHTO T 209
- Field Compacted Gyratory Specimens - ODOT TM 326

When less than 1,000 tons of mix is placed in a day, perform a minimum of one series of tests per day. Provide test results to the Engineer by the middle of the following work shift. The Engineer may waive the requirement for any of AASHTO T 308, AASHTO T 30, AASHTO T 329, and ODOT TM 326 on a daily basis. The Engineer may waive the requirement for AASHTO T 209 when less than 500 Tons of ACP is placed in a single work shift.

Provide samples or split samples to the Engineer when requested.

00744.41 Mixing Temperature - Replace the table with the following:

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Type	Temperature, °F Maximum at Mixer	Minimum Behind Paver
HMAC	350	240
WMAC	350	215

00744.49 Compaction - Replace the paragraph that begins "Determine compliance with…" with the following paragraph:

Determine compliance with density Specifications by random testing of the compacted surface with calibrated nuclear gauges. Determine the density by averaging QC tests performed by a CDT with the nuclear gauge operated in the backscatter mode according to AASHTO T 355 at one random location for each 100 tons of asphalt concrete placed, but take no less than 10 tests each shift. Do not locate the center of a density test less than 1 foot from the Panel edge. Calculate MAMD according to ODOT TM 305. The Engineer may waive compaction testing requirements when less than 500 tons of ACP is placed in a single work shift.

~~1.04 QUALITY ASSURANCE~~

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

~~3.02 BASE COURSE~~

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.

B. Variation from True Elevation: Within 1/2 inch (12 mm).

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

~~B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.~~

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SECTION 32 1713
PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

B. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking Bumpers: Precast concrete, conforming to the following:
   1. Profile: Manufacturer's standard.
   2. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
   3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
   4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
   5. Air Entrainment Admixture: ASTM C260/C260M.
   6. Concrete Mix: Minimum 5,000 psi (34 MPa) compressive strength after 28 days, air entrained to 5 to 7 percent.
   7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   8. Embed reinforcing steel, and drill or sleeve for two dowels.
   9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

B. Dowels: Cut reinforcing steel, 1/2 inch diameter, 14 inch long, pointed tip.

C. Adhesive: Epoxy type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

END OF SECTION

SECTION 32 1723.13
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

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. Installation methods.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Parking Lots: White.
   2. Handicapped Symbols: Blue.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Public ROW Pavement Markings
   1. Longitudinal Pavement Markings: Shall conform to the requirements of Section 00865 of the Oregon Standard Specifications for Construction Method A (Profiled) and/or Method B (Non-Profiled).
   2. Stop Bars, Crosswalk Markings, Symbols, and Legends: Preformed thermoplastic products measuring no less than 125 mils (3.15 mm) in thickness
      a. Bicycle Lane Symbols: Preformed thermoplastic products measuring no less than 90 mils (2.29 mm) in thickness.
   3. Substitutions: See Section 01 6000 - Product Requirements.

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 Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F (10 degrees C) or more than 95 degrees F (35 degrees C).

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch (0.4 mm), minimum.
   3. Width Tolerance: Plus or minus 1/8 inch (3 mm).

G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

I. Applied longitudinal pavement markings shall not deviate by more than one half inch from the design layout on straight runs, and no more than one inch from design layout along curves, as measured from centerline of stripe to the design location. Longitudinal pavement markings shall maintain unwavering alignments with smooth transitions. Offsets from parallel pavement markings shall be maintained at a consistent distance. Markings shall be applied without splatter, and shall have clean edges, and start and stop ends.

END OF SECTION

SECTION 32 3313

SITE BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior bicycle racks.

1.02 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

1.03 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. Installation methods.

C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.04 DELIVERY, STORAGE, AND HANDLING

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

B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 BICYCLE RACKS

A. Exterior Bicycle Racks: Device allows user-provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
   1. Style: Inverted horseshoe rack formed by one u-shaped bend of round pipe.
   2. Capacity: Two bicycles.
   3. Mounting, Ground: In-ground anchor.
   4. Finish: Powder coat, maintenance-free and weather-resistant.
   5. Color: As selected by Architect from manufacturer's standard range.
   6. Accessories: In-ground grout cover.

B. Materials:
   1. Pipe: Carbon steel, ASTM A53/A53M, Schedule 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks.

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

C. Do not begin installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install level, plumb, square, and correctly located as indicated on drawings.

C. In-Ground Anchor Installation:
   1. Prepare holes in size according to manufacturer's instructions.
   2. Place anchoring bolts through the holes in pipe.
   3. Lower rack into holes, ensuring the bottom of lower bends are at least 1-1/2 inch from the ground.
   4. Place concrete.
   5. Level rack before concrete sets.
   6. Support until dry.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 9219

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydroseeding, mulching .

B. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Topsoil material.

B. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

C. Section 31 2323 - Fill: Topsoil material.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 SEED MIXTURE

2.02 SEED

A. Provide the following seed mixture: (Per 2018 ODOT Standard Specifications)

	Broadcast Rate (PLS)	Common Seed Name
1.	3.0 lbs/acre	Sainfoin
2.	3.0 lbs/acre	Bozoisky Russian Wildrye
3.	3.0 lbs/acre	Chief Intermediate Wheatgrass
4.	2.5 lbs/acre	Delar Small Burnet
5.	2.0 lbs/acre	CD II Crested Wheatgrass
6.	2.0 lbs/acre	P-27 Siberian Wheatgrass
7.	1.5 lbs/acre	Sherman Big Bluegrass
8.	1.5 lbs/acre	Ladak Alfalfa
9.	1.0 lbs/acre	Covar Sheep Fescue
10.	0.5 lbs/acre	Blue Flax

B. Use only certified weed free seed. Provide copies of the certification to the Engineer. Inoculate the alfalfa prior to incorporation into the seed mixture.

C. Provide straw mulch according to 01030.15(b) per ODOT Standard Specifications

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. In addition to other areas within the site that have soil cover and where disturbed by the Contractor's operations, stabilize the overburden storage areas, safety berms, and stormwater berms by seeding, mulching, and tackifying, as directed.

3.03 SEEDING

A. Apply a commercial straw mulch tackifier according to the manufacturer’s directions and at the recommended rate.

B. Apply seed and mulch according to Section 01030 per ODOT Standard Specifications

C. If conditions allow and the Contractor chooses, the area may be stabilized by applying seed using a range drill with a roller attachment. All areas seeded with the range drill and roller will not need to be subsequently covered with mulch and tackifier.

D. All variations to these requirements require written approval by the Engineer.

END OF SECTION

SECTION 33 0110.58

DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines specified in Section 33 1416.

B. Disinfection of building domestic water piping specified in Section 22 1005.

1.02 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping: Disinfection of building domestic water piping system.

B. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites; 2010, Addendum 2011.

B. AWWA B301 - Liquid Chlorine; 2010.

C. AWWA B302 - Ammonium Sulfate; 2016.

D. AWWA B303 - Sodium Chlorite; 2010.

E. AWWA C651 - Disinfecting Water Mains; 2014.

1.04 SUBMITTALS

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

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From authority having jurisdiction indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

F. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.

B. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 33 0513
MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Modular precast concrete manhole sections with tongue-and-groove joints, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 04 0511 - Mortar and Masonry Grout.

C. Section 04 2000 - Unit Masonry: Masonry units.

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015a.

D. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric); 2015a.

E. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008, with Editorial Revision (2016).

F. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric); 2008b (Reapproved 2013).

1.04 SUBMITTALS

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

B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

C. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

D. Manufacturer's Qualification Statement.

1.05 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Concrete: As specified in Section 03 3000.

C. Mortar and Grout: As specified in Section 04 2000, Type S.

2.02 COMPONENTS

A. Lid and Frame: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable lockable lid, closed lid design; or as specified by the City of Millersburg.

B. Manhole Steps: Formed galvanized steel rungs; 3/4 inch (19 mm) diameter. Formed integral with manhole sections.

2.03 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inches (1,200 mm) diameter.

D. Clear Inside Dimensions: As indicated.

E. Design Depth: As indicated.

F. Clear Lid Opening: As indicated.

G. Pipe Entry: Provide openings as indicated.

H. Steps: As required by code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Set cover frames and covers level without tipping, to correct elevations.

G. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 SCHEDULES

A. Storm Sewer Manholes: Precast concrete sections, galvanized steel steps, 48 inch (1200 mm) inside dimension, to depth indicated, with bolted lid.

END OF SECTION

SECTION 33 1416
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines.

B. Valves.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

B. Section 09 9113 - Exterior Painting.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

E. Section 31 2323 - Fill: Bedding and backfilling.

F. Section 33 0110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

G. Section 33 0513 - Manholes and Structures.

1.03 REFERENCE STANDARDS

A. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

B. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.

C. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with 2021 Oregon Plumbing Specialty Code requirements and the City of Millersburg Standard Construction Specifications

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. PVC Pipe: ASTM D1785, Schedule 40.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D2855, solvent weld.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.04 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 3000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide ____ sq ft (____ sq m) thrust restraint bearing on subsoil.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with City of Millersburg code.

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure not less than 2.5 ft of cover.

D. Install pipe to indicated elevation to within tolerance of 5/8 inches (20 mm).

E. Route pipe in straight line.

F. Install pipe to allow for expansion and contraction without stressing pipe or joints.

G. Install access fittings to permit disinfection of water system performed under Section 33 0110.58.

H. Slope water pipe and position drains at low points.

I. Install trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 31 2316.13.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 33 3113
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to septic (evaporative) lagoon.

C. Cleanout access.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 2323 - Fill: Bedding and backfilling.

E. Section 33 0513 - Manholes and Structures.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

B. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation with size, location and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

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

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter as shown on plans, bell and spigot style solvent sealed joint end.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 2323.

B. Pipe Cover Material: As specified in Section 31 2323.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

D. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

E. Install trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 31 2316.13.

3.04 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.

3.06 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4211
STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of drainage system to municipal sewers.

C. Catch basins, Trench drains, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 2323 - Fill: Bedding and backfilling.

E. Section 33 0513 - Manholes and Structures.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2016.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).

E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

F. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

G. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

H. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.

I. DIN EN 1433 - Drainage Channels for Vehicular and Pedestrian Areas - Classification, Design and Testing Requirements; Marking and Evaluation of Conformity; 2005.

J. DIN 19580 - Drainage channels for vehicular and pedestrian areas - Durability, mass per unit area and evaluation of conformity; 2010.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation with size, location and installation of service utilities.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

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

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D3034, Type PSM, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.

C. Plastic Pipe: ASTM D3350, SDR 11; High Density Polyethylene (HDPE) solid wall pipe; with cell classification of 335434C or better, thermal butt fusion joints in accordance with manufacturer's recommendations.

D. Corrugated Steel Pipe: AASHTO M 36 Type I; end joints; helical lock seam; coated inside and out with 0.050 inch (1.3 mm) thick bituminous coating.

E. Coupling Bands: Galvanized steel, 0.052 inches (1.3 mm) thick x 10 inches (250 mm) wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

C. Filter Fabric: Non-biodegradable, woven

D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.

E. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.

2.03 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Lids and Drain Covers: Cast iron, hinged to cast iron frame.
   1. Catch Basin:
      a. Lid Design: Linear grill.
   2. Cleanout:
      a. Lid Design: Linear grill.
   3. Area Drain:
      a. Lid Design: Linear grill.

B. Base Pad: Cast-in-place concrete of type specified in Section 03 3000, levelled top surface to receive concrete shaft sections, sleeved to receive sanitary sewer pipe sections.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2323.

B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 2316.13 - Trenching for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

E. Make connections through walls through sleeved openings, where provided.

F. Install continuous trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 31 2316.13.

3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

E. Prefabricated trench drains:
   1. Excavate; prepare substrate and supports according to the manufacturer's printed installation instructions.
   2. Install prefabricated trench drain system according to the manufacturer's printed installation instructions.
   3. Expansion, Construction, and Control Joints: Do not locate trench drain system on an expansion, construction or control joint in concrete or pavement. Where concrete or pavement joints running transverse to direction of flow cross the trench drain system, locate concrete or pavement joints and trench drain system joints so that both coincide.
   4. Concrete Trench Support: 3000 pounds per square inch (20.68 MPa) compressive strength, minimum.
      a. Provide support on all sides of trench in minimum thickness recommended by trench drain system manufacturer.
      b. Screed and finish top edge of concrete flush with top surface of trench drain system.
      c. Do not use secondary edge finishing tools.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01 4000 - Quality Requirements.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4213
STORMWATER CULVERTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe culvert, joints and accessories.

B. Bedding and slope protection at pipe end.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete grout fill to adjacent construction.

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 31 2323 - Fill: Bedding and backfilling.

E. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe; 2017.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe, fittings and accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Accurately record actual locations of pipe runs, connections, and invert elevations.

E. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 CULVERT PIPE, GENERAL

A. Regulatory Requirements: Conform to applicable code for materials and installation of the work of this section.

2.02 STEEL CULVERT PIPE

A. Corrugated Steel Pipe: Fabricated of ASTM A929/A929M galvanized steel sheet:

B. Coupling Bands: Galvanized steel, 0.052 inches (1.3 mm) thick x 10 inches (250 mm) wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.04 ACCESSORIES

A. Fill at Pipe Ends: Riprap as specified in Section 31 3700.

PART 3 EXECUTION

3.01 EXCAVATING

A. See Section 31 2316.13 - Trenching for additional requirements.

B. Excavate culvert trench to 12 inches (300 mm) below pipe invert. Hand trim excavation for accurate placement of pipe to elevations indicated.

3.02 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe and accessories in accordance with manufacturer's instructions

C. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

D. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

E. Repair surface damage to pipe protective coating with two coats of compatible bituminous paint coating.

3.03 PIPE ENDS

A. Place fill at pipe ends, at embankment slopes.

3.04 TOLERANCES

A. Lay pipe to alignment and slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

B. Maximum Variation From Intended Elevation of Culvert Invert: 1/2 inch (12 mm).

3.05 PROTECTION

A. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

END OF SECTION

Appendix A

Geotechnical Engineering Report

Millersburg Fire Station
Old Salem Road NE
Millersburg, Oregon

Prepared for:
Soderstrom Architects
1200 NW Naito Parkway, Suite 410
Portland, Oregon 97209

August 26, 2020
PBS Project 17846.000

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1 INTRODUCTION

1.1 General

This report presents results of PBS Engineering and Environmental Inc. (PBS) geotechnical engineering services for the proposed fire station located on Old Salem Road NE in Millersburg, Oregon (site). The general site location is shown on the Vicinity Map, Figure 1. The locations of PBS' explorations in relation to existing and proposed site features are shown on the Site Plan, Figure 2.

1.2 Purpose and Scope

The purpose of PBS' services was to develop geotechnical design and construction recommendations in support of the planned fire station. This was accomplished by performing the following scope of services.

1.2.1 Literature and Records Review

PBS reviewed various published geologic maps of the area for information regarding geologic conditions and hazards at or near the site.

1.2.2 Subsurface Explorations

Four borings were advanced to depths of 11.5 to 51.5 feet below the existing ground surface (bgs) and two cone penetrometer test (CPT) probes were advanced to depths of approximately 42 to 68 feet bgs, within the development footprint and surrounding pavement areas. The borings were logged and representative soil samples collected by a member of the PBS geotechnical engineering staff. The approximate boring locations are shown on the Site Plan, Figure 2. The interpreted boring and CPT logs are presented as Figures A1 through A6 in Appendix A, Field Explorations. Shear wave velocities were collected at 2-meter intervals in CPT-1 and are presented on Figure A7 in Appendix A.

1.2.3 Field Infiltration Testing

One cased-hole, falling-head field infiltration test was completed in boring B-2 within the proposed paved area of the fire station at a depth of 5 feet bgs. Infiltration testing was monitored by PBS geotechnical engineering staff.

1.2.4 Soils Testing

Soil samples were returned to our laboratory and classified in general accordance with the Unified Soil Classification System (ASTM D2487) and/or the Visual-Manual Procedure (ASTM D2488). Laboratory tests included natural moisture contents, grain-size analyses, and Atterberg limits. Laboratory test results are included in the exploration logs in Appendix A, Field Explorations; and in Appendix B, Laboratory Testing.

1.2.5 Geotechnical Engineering Analysis

Data collected during the subsurface exploration, literature research, and testing were used to develop site-specific geotechnical design parameters and construction recommendations.

1.2.6 Report Preparation

This Geotechnical Engineering Report summarizes the results of our explorations, testing, and analyses, including information relating to the following:

- Field exploration logs and site plan showing approximate exploration locations
- Laboratory test results
- Infiltration test results
- Groundwater considerations
- Liquefaction potential

- Seismic site hazard study that includes:
    - Discussion of geologic and seismic hazards impacting the site
    - Location of nearby faults
    - Evaluation of liquefaction potential
- Mat foundation design recommendations:
    - Minimum embedment
    - Allowable bearing pressure
    - Estimated static settlement (total and differential)
    - Sliding coefficient
- Earthwork and grading, cut, and fill recommendations:
    - Structural fill materials and preparation, and reuse of on-site soils
    - Wet weather considerations
    - Utility trench excavation and backfill requirements
    - Temporary and permanent slope inclinations
- Seismic design criteria in accordance with the 2019 Oregon Structural Specialty Code (OSSC)
- Slab and pavement subgrade preparation recommendations
- Recommended asphalt concrete (AC) pavement sections

1.3 Project Understanding

PBS understands the City of Millersburg (City) previously contracted with the City of Albany for fire protection through the Albany Fire Department. In 2018 the City withdrew from Albany Rural and Jefferson Rural Fire Districts and took responsibility for providing fire service to the community. The City entered into an intergovernmental agreement with the City of Albany for the staffing and operation of a fire station in Millersburg. Operations are currently conducted from a temporary station located on City-owned property. In addition, the City owns 150 acres that surround the temporary station, upon which the new station will be located.

The new fire station will have a footprint of approximately 8,600 square feet that will house nine dorm-style sleeping rooms; living quarters including a day room, kitchen, patio space, and workout room; three restroom/shower rooms; general use areas; crew office; lobby; public restroom; a three-wide, two-deep fire engine bay and shop/tool area; and associated paved drive lanes and parking areas.

2 SITE CONDITIONS

2.1 Surface Description

The site is located within the central Willamette Valley near the town of Millersburg, Oregon. The site is bordered by agricultural fields to the south and west, Old Salem Road to the east, and a residential parcel to the north. The site is roughly rectangular, except the eastern extent that is bordered by Old Salem Road, and is currently undeveloped and vegetated. Based on available DOGAMI LiDAR data, the site slopes slightly to the south and west, with ground surface elevations ranging from a maximum of about 247 feet above mean sea level (amsl) at the northeast corner to 235 feet amsl at the southwest corner (DOGAMI, 2020).

2.2 Geologic Setting

2.3 Regional Geologic Setting

The site is located within the central portion of the Willamette Valley, a tectonic depression within the physiographic province of the Puget-Willamette Lowland that separates the Cascade Range from the Coast Range, and extends from the Puget Sound, Washington, to Eugene, Oregon (Yeats et al., 1996). The Puget-Willamette Lowland is situated along the Cascadia Subduction Zone (CSZ) where oceanic rocks of the Juan de Fuca Plate are subducting beneath the North American Plate, resulting in deformation and uplift of the Coast Range and volcanism in the Cascade Range. Northwest-trending faults accommodating clockwise rotation of the North American Plate are found throughout the Puget-Willamette lowland (Brocher et al., 2017; USGS, 2020).

The Willamette Valley forms a broad alluvial basin with the Willamette River draining northward along the axis of the valley. Extensive valley infilling throughout the Quaternary and catastrophic flooding related to the Late Pleistocene Missoula Floods has subsequently buried older Oligocene and Eocene sedimentary and volcanic basement rocks and concealed many of the structural features throughout the valley (Wiley, 2006). Willamette River tributaries exiting the Coast Range and Cascade Range have contributed to terrace formations and broad alluvial fans protruding from range fronts into the valley.

2.4 Local Geology

The site is underlain by Willamette Silt (Qws) described as unconsolidated fine-grained deposits primarily composed of silt, fine-grained sand, and clay (McClaughry et al., 2010). These fine-grained deposits are attributed to the cataclysmic Missoula Floods due to cyclical breaching of the glacially impounded Lake Missoula during the Pleistocene. Elevations below approximately 250 to 300 feet amsl were blanketed with 10 to 20 feet of fine-grained materials as floodwaters slowly receded from the Willamette Valley.

2.5 Subsurface Conditions

The site was explored by drilling four borings, designated B-1 through B-4, and advancing two CPTs, designated CPT-1 and CPT-2, to depths between approximately 11.5 and 68 feet bgs. The drilling was performed by Holt Services, Inc., of Vancouver, Washington, using a truck-mounted CME 75 drill rig and mud rotary drilling techniques. CPT advancement was performed by Oregon Geotechnical Explorations of Keizer, Oregon, using a 20-ton truck mounted with a Vertek CPT 10 cm^2 electric seismic piezo cone.

PBS has summarized the subsurface units as follows:

LEAN and FAT CLAY (CL and CH):	Medium to high plasticity clays were encountered in all borings from the ground surface to approximately 15 feet bgs. The materials were medium stiff to stiff, with corresponding SPT N-values between 5 to 12, brown, moist to wet, and contained fine- to medium-grained sand.
CLAY and ELASTIC SILT (CL/CH and MH):	Medium to high plasticity clays and silt were encountered in boring B-3 from approximately 15 feet bgs to termination depth of 51.5 feet bgs. The materials were stiff to very stiff with one lens of medium dense silty sand between 31 to 33 feet bgs. Corresponding SPT N-values for the material between 15 to 51.1 feet bgs were between 7 to 43. The materials were moist to wet, primarily blue-gray with areas of orange mottling, and contained fine- to coarse-grained sand.

2.6 Groundwater

Static groundwater was encountered during our exploration at a depth of approximately 12 feet bgs, following flushing and bailing of the drilling mud and water within the boring, but was slowly rising. Pore pressure dissipation testing in the CPTs indicate static groundwater may be as shallow as 6 feet bgs. Based on a review of regional groundwater logs provided by the Oregon Water Resources Department (OWRD), we anticipate that the static groundwater level is present at a depth less than 10 feet bgs. Please note that groundwater levels can fluctuate during the year depending on climate, irrigation season, extended periods of precipitation, drought, and other factors.

2.7 Infiltration Testing

PBS completed a cased-hole, falling-head infiltration test in boring B-2 at a depth of 5 feet bgs within the proposed paved area. The infiltration test was conducted within the 6.25-inch inside diameter, hollow-stem auger used to drill the boring. The auger was filled with water to achieve a minimum 1-foot-high column of water. After a period of saturation, the height of the water column in the pipe was then measured initially and at regular, timed intervals. Results of our field infiltration testing are presented in Table 1.

Table 1. Infiltration Test Results

Test Location	Depth (feet bgs)	Field Measured Infiltration Rate (in/hr)	Soil Classification
B-2	5	0.06	Sandy Lean CLAY (CL)

The infiltration rate listed in Table 1 is not a permeability/hydraulic conductivity, but a field-measured rate, and does not include correction factors related to long-term infiltration rates. The design engineer should determine the appropriate correction factors to account for the planned level of pre-treatment, maintenance, vegetation, siltation, etc. Field-measured infiltration rates are typically reduced by a minimum factor of 2 to 4 for use in design.

Soil types can vary significantly over relatively short distances. The infiltration rates noted above are representative of one discrete location and depth. Installation of infiltration systems within the layer the field rate was measured is considered critical to proper performance of the systems.

3 GEOLOGIC HAZARDS

Geologic and seismic hazards are defined as conditions associated with the geologic and seismic environment that could influence existing and/or proposed improvements. Geologic and seismic hazards that could affect the site's development are identified below and should be considered during the planning process.

3.1 Seismicity and Faulting

3.1.1 Historical Seismicity

Regional historical seismicity information was acquired from the Advanced National Seismic System (ANSS) Comprehensive Catalog, hosted by the Northern California Earthquake Data Center (NCEDC), and is presented on Figure 7. These data include earthquakes with magnitudes exceeding M 2.5, within a 150-km radius of the city of Millersburg, Oregon, and recorded between 1963 and 2017 (NCEDC, 2017). Magnitudes within the ANSS dataset are recorded as local magnitude, surface-wave magnitude, body-wave magnitude, moment magnitude, and magnitude of completeness.

The most significant historical earthquake within the Willamette Valley region occurred on March 25, 1993, approximately 50 km northeast of the site, producing a M 5.6 earthquake known as the Scotts Mills

earthquake. The Scotts Mills earthquake is one of the largest historical earthquakes observed in the region and caused damage to structures as far as Salem and Yamhill, Oregon (Wong et al., 1993).

3.1.2 Seismic Sources

Several types of seismic sources exist in the Pacific Northwest, which are outlined below. Volcanic sources beneath the Cascade Range are not considered further in this study. Cascade Range earthquakes rarely exceed about M 5.0 in size and are believed be far enough removed to not pose a threat to the site (NCEDC, 2017).

3.1.2.1 Cascadia Subduction Zone (CSZ) – Interface Earthquakes

The CSZ represents the boundary between the subducting Juan de Fuca tectonic plate and the overriding North American tectonic plate (Figure 3). Recurrence intervals for subduction zone earthquakes are based on studies of the geologic record, with studies estimating a recurrence interval between 500 to 530 years (Goldfinger et al., 2012). Geologic evidence and written records from Japan suggest the most recent earthquake occurred in January 1700. The 1700 earthquake is believed to have ruptured much of the approximate 620-mile (1,000 km) length of the CSZ, and was estimated at moment magnitudes of M_W 9.0. The horizontal distance from the edge of the CSZ megathrust is located approximately 115 miles (180 km) west from Millersburg, Oregon, and the depth of the subducting slab is less than approximately 25 miles (40 km) below the site (Hayes, 2018; Blair et al., 2012). The current US Geological Survey risk-based maximum credible earthquake for CSZ megathrust is M_W 9.0±0.2 (USGS, 2008).

3.1.2.2 Intraslab Earthquakes

Intraslab earthquakes occur within the subducting slab. They are problematic in the sense that they do not have a surface expression or rupture the ground surface and their seismicity generates deformation along many faults within the slab (Kirby et al., 2002). The estimated depth to the subducting Juan de Fuca plate under Millersburg is approximately 40 km (Hayes, 2018; Blair et al., 2012). Therefore, intraslab earthquakes are a seismic hazard that must be considered.

3.1.2.3 Crustal Earthquakes and Faults

At least 55 faults or fault zones are present in Oregon, primarily in the northwest portion of the state and east of the Cascade Range. Studies of small earthquakes in the region indicate most crustal earthquake activity is occurring at depths of 10 to 20 km (Yelin and Patton, 1991).

Review of the USGS Quaternary Fault Database indicates the site is located within close proximity (less than 25 km) to several active faults and tectonic features (Figure 6; USGS, 2020). These faults and features are summarized in Table 2.

Table 2. Faults within the Site Vicinity

Fault Zone or Feature Name	USGS Fault Identification Number	Proximity to Site (Surface Projection in km)
Mill Creek Fault	No. 871	9.1
Salem-Eola Hills Homocline	No. 719	11.3
Owl Creek Fault	No. 870	13.3
Waldo Hills Fault	No. 872	14.7
Corvallis Fault Zone	No. 869	16.9

3.1.3 Other Seismic Hazards

Other site-specific seismic hazards considered include earthquake-induced landslides, fault rupture, seiche and tsunami inundation, and earthquake shaking. Based on the flat surface topography and geology at the site, the risk from landslides and earthquake-induced landslides is absent. The site's distance from known locally active Quaternary faults removes the risk of fault rupture. Due to the location of the site, the risk of seiche and tsunami inundation is absent. Strong earthquake ground shaking will occur during a code-based seismic event on the CSZ as well as from local faults. Based on our current project understanding, our opinion is that effects of earthquake ground motions can be accounted for by using code-based design procedures and the code-based design response spectrum.

3.1.3.1 Liquefaction

Liquefaction is defined as a decrease in the shear resistance of loose, saturated, cohesionless soil (e.g., sand) or low plasticity silt soils, due to the buildup of excess pore pressures generated during an earthquake. This results in a temporary transformation of the soil deposit into a viscous fluid. Liquefaction can result in ground settlement, foundation bearing capacity failure, and lateral spreading of ground.

Based on a review of the Oregon HazVu, the site is shown as having a high liquefaction hazard (DOGAMI, 2020). Based on the results of our analyses, 4 to 6 inches of liquefaction settlement could occur as a result of a code-based earthquake. Due to the relatively flat site topography and distance from the nearest free face (i.e., river or slough bank), our current opinion is that the risk of structurally damaging lateral spreading associated with liquefaction is low.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Geotechnical Design Considerations

The silt and sand encountered below groundwater at the site are susceptible to liquefaction during a code-based earthquake. Support of the new structure on shallow foundations is not feasible without some form of consideration of earthquake risk. For our evaluation we considered two options for foundation support, each having different levels of risk associated with damage during an earthquake. Based on correspondence with the design team, a mat foundation supported on the existing, non-liquefiable crust was the preferred alternative. Detailed design and construction recommendations are included in the following sections of this report.

4.2 Seismic Design Considerations

4.2.1 Code-Based Seismic Design Parameters

The current seismic design criteria for this project are based on the 2019 OSSC. Due to the potential for liquefaction of site soils, the site should be considered Site Class F. However, in accordance with ASCE 7-16, for structures having a fundamental period of less than 0.5 second, a site-response analysis is not required to determine the spectral accelerations of liquefied soils and seismic design parameters can be determined using the pre-liquefaction site class, Site Class D. The seismic design criteria, in accordance with the 2019 OSSC, are summarized in Table 3.

Table 3. 2019 OSSC Seismic Design Parameters

Parameter	Short Period	1 Second
Maximum Credible Earthquake Spectral Acceleration	S_s = 0.80 g	S_1 = 0.42 g
Site Class	D*	
Site Coefficient	F_a = 1.20	F_v = 1.88 **
Adjusted Spectral Acceleration	S_{MS} = 0.96 g	S_{M1} = ***
Design Spectral Response Acceleration Parameters	S_{DS} = 0.64 g	S_{D1} = ***
M_{CEG} Peak Ground Acceleration	PGA = 0.37 g	
Site Amplification Factor at PGA	F_{PGA} = 1.175	
Site Modified Peak Ground Accelerations	PGA_M = 0.44 g	

g= Acceleration due to gravity

* Site Class D can be used if the fundamental period of the new structure is less than 0.5 second.

** This value of F_v shall only be used to calculate T_s

*** Site-specific site response analysis is not required for structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_s is determined by Eq. (12.8-2) for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T > 1.5T_s$ or Eq. (12.8-4) for $T > T_L$.

4.3 Mat Foundation on Non-Liquefiable Crust

The risk of surface manifestation of liquefaction is reduced by the presence of the existing non-liquefiable layer at the surface (i.e., "crust"). This crust is approximately 30 feet thick (represented by the unsaturated and non-liquefiable soil). Use of a mat foundation would help reduce the impacts of possible differential settlement. The presence of the crust does not reduce the risk of liquefaction in the deeper soils and 4 to 6 inches of liquefaction settlement would probably still occur at the site. Mat foundations should be designed to span a distance of at least 10 feet in the case of surface manifestation of liquefaction and loss of ground support. Specific recommendations for design and construction are included in the following sections.

4.3.1 Design Bearing Pressure

Mat foundations can be designed using a maximum allowable bearing pressure of 1,500 pounds per square foot (psf). The recommended allowable bearing pressure applies to the total of dead plus long-term live loads. Allowable bearing pressures may be increased by one-third for seismic and wind loads.

Foundations will settle in response to column and wall loads. Based on our evaluation of the subsurface conditions and our analysis, we estimate post-construction static settlement will be less than approximately 1 inch. Differential settlement will be on the order of one-half of the total settlement.

4.3.2 Foundation Embedment Depth

PBS recommends that the perimeter of mat foundations be founded a minimum of 18 inches below the lowest adjacent grade. This can be accomplished with a thickened edge if the mat thickness is less than 18 inches.

4.3.3 Foundation Preparation

Excavations for foundations should be carefully prepared to a neat and undisturbed state. A representative from PBS should confirm suitable bearing conditions and evaluate all exposed footing subgrades. Observations should also confirm that loose or soft materials have been removed from new footing excavations and concrete slab-on-grade areas. Localized deepening of the excavations may be required to penetrate loose, wet, or deleterious materials. We suggest recompacting the exposed subgrade prior to forming and pouring concrete footings.

Satisfactory subgrade support for building mat foundations can be obtained from the on-site soil subgrade prepared in accordance with our recommendations presented in the Site Preparation, Wet/Freezing Weather and Wet Soil Conditions, and Imported Granular Materials sections of this report. A minimum 6-inch-thick layer of imported granular material should be placed and compacted over the prepared subgrade. Thicker aggregate sections may be necessary where undocumented fill or loose soils are present at subgrade elevation, and/or during wet conditions. Imported granular material should be composed of crushed rock or crushed gravel that is relatively well graded between coarse and fine, contains no deleterious materials, has a maximum particle size of 1½ inch, and has less than 5 percent by dry weight passing the US Standard No. 200 Sieve.

Mats supported on a subgrade and base course prepared in accordance with the preceding recommendations may be designed using a modulus of subgrade reaction (k) of 150 pounds per cubic inch (pci).

4.3.4 Lateral Resistance

Lateral loads can be resisted by passive earth pressure on the sides of footings and grade beams, and by friction at the base of the footings. A passive earth pressure of 250 pounds per cubic foot (pcf) may be used for footings confined by native soils and new structural fills. The allowable passive pressure has been reduced by a factor of two to account for the large amount of deformation required to mobilize full passive resistance. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. For footings supported on native soils or new structural fills, use a coefficient of friction equal to 0.35 when calculating resistance to sliding. These values do not include a factor of safety (FS).

4.4 Ground Moisture

4.4.1 General

The perimeter ground surface and hard-scape should be sloped to drain away from all structures and away from adjacent slopes. Gutters should be tight-lined to a suitable discharge and maintained as free-flowing. All crawl spaces, if planned, should be adequately ventilated and sloped to drain to a suitable, exterior discharge.

4.4.2 Perimeter Footing Drains

Due to the relatively low permeability of site soils and the potential for perched groundwater at the site, we recommend perimeter foundation drains be installed around all proposed structures.

The foundation subdrainage system should include a minimum 4-inch diameter perforated pipe in a drain rock envelope. A non-woven geotextile filter fabric, such as Mirafi 140N or equivalent, should be used to completely wrap the drain rock envelope, separating it from the native soil and footing backfill materials. The invert of the perimeter drain lines should be placed approximately at the bottom of footing elevation. Also, the subdrainage system should be sealed at the ground surface. The perforated subdrainage pipe should be laid to drain by gravity into a non-perforated solid pipe and finally connected to the site drainage stem at a suitable location. Water from downspouts and surface water should be independently collected and routed to a storm sewer or other positive outlet. This water must not be allowed to enter the bearing soils.

4.4.3 Vapor Flow Retarder

A continuous, impervious barrier must be installed over the ground surface in the crawl space, if planned, and under slabs of all structures. Barriers should be installed per the manufacturer's recommendations.

4.5 Pavement Design

The provided pavement recommendations were developed based on our experience with similar developments and references the associated Oregon Department of Transportation (ODOT) specifications for construction.

The minimum recommended pavement section thicknesses are provided in Table 4. Depending on weather conditions at the time of construction, a thicker aggregate base course section could be required to support construction traffic during preparation and placement of the pavement section.

Table 4. Minimum AC Pavement Sections

Traffic Loading	AC (inches)	Base Course (inches)	Subgrade
Pull-in Car Parking Only	3	9	Stiff subgrade as verified by PBS personnel**
Drive Lanes and Access Roads	5	12*	

* For drive lanes and access roads, the base course should be underlain by stabilization geotextile fabric such as Mirafi 500X or an approved equivalent

** Subgrade must pass proofroll

The asphalt cement binder should be selected following ODOT SS 00744.11 – Asphalt Cement and Additives. The AC should consist of ½-inch hot mix asphalt concrete (HMAC) with a maximum lift thickness of 3 inches. The AC should conform to ODOT SS 00744.13 and 00744.14 and be compacted to 91 percent of the maximum theoretical density (Rice value) of the mix, as determined in accordance with ASTM D2041.

Heavy construction traffic on new pavements or partial pavement sections (such as base course over the prepared subgrade) will likely exceed the design loads and could potentially damage or shorten the pavement life; therefore, we recommend construction traffic not be allowed on new pavements, or that the contractor take appropriate precautions to protect the subgrade and pavement during construction.

If construction traffic is to be allowed on newly constructed road sections, an allowance for this additional traffic will need to be made in the design pavement section.

5 CONSTRUCTION RECOMMENDATIONS

5.1 Site Preparation

Construction of the proposed structure will involve clearing and grubbing of the existing vegetation or demolition of possible existing structures. Demolition should include removal of existing pavement, utilities, etc., throughout the proposed new development. Underground utility lines or other abandoned structural elements should also be removed. The voids resulting from removal of foundations or loose soil in utility lines should be backfilled with compacted structural fill. The base of these excavations should be excavated to firm native subgrade before filling, with sides sloped at a minimum of 1H:1V to allow for uniform compaction. Materials generated during demolition should be transported off site or stockpiled in areas designated by the owner's representative.

5.1.1 Proofrolling/Subgrade Verification

Following site preparation and prior to placing aggregate base over mat foundation, floor slab, and pavement subgrades, the exposed subgrade should be evaluated either by proofrolling or another method of subgrade verification. The subgrade should be proofrolled with a fully loaded dump truck or similar heavy, rubber-tire

construction equipment to identify unsuitable areas. If evaluation of the subgrades occurs during wet conditions, or if proofrolling the subgrades will result in disturbance, they should be evaluated by PBS using a steel foundation probe. We recommend that PBS be retained to observe the proofrolling and perform the subgrade verifications. Unsuitable areas identified during the field evaluation should be compacted to a firm condition or be excavated and replaced with structural fill.

5.1.2 Wet/Freezing Weather and Wet Soil Conditions

Due to the presence of fine-grained clay and silt at the surface, construction equipment may have difficulty operating on the near-surface soils when the moisture content of the surface soil is more than a few percentage points above the optimum moisture required for compaction. Soils disturbed during site preparation activities, or unsuitable areas identified during proofrolling or probing, should be removed and replaced with compacted structural fill.

Site earthwork and subgrade preparation should not be completed during freezing conditions, except for mass excavation to the subgrade design elevations.

Protection of the subgrade is the responsibility of the contractor. Construction of granular haul roads to the project site entrance may help reduce further damage to the pavement and disturbance of site soils. The actual thickness of haul roads and staging areas should be based on the contractors' approach to site development, and the amount and type of construction traffic. The imported granular material should be placed in one lift over the prepared undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. A geotextile fabric should be used to separate the subgrade from the imported granular material in areas of repeated construction traffic. The geotextile should meet the specifications of ODOT SS Section 02320.10 and SS 02320.20, Table 02320-1 for soil separation. The geotextile should be installed in conformance with ODOT SS 00350.00 – Geosynthetic Installation.

5.1.3 Dry Weather Conditions

Clay soils should be covered within 4 hours of exposure by a minimum of 4 inches of crushed rock or plastic sheeting during the dry season. Exposure of these materials should be coordinated with the geotechnical engineer so that the subgrade suitability can be evaluated prior to being covered.

5.2 Excavation

The near-surface soils at the site can be excavated with conventional earthwork equipment. Sloughing and caving should be anticipated. All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor is solely responsible for adherence to the OSHA requirements. Trench cuts should stand relatively vertical to a depth of approximately 4 feet bgs, provided no groundwater seepage is present in the trench walls. Open excavation techniques may be used provided the excavation is configured in accordance with the OSHA requirements, groundwater seepage is not present, and with the understanding that some sloughing may occur. Trenches/excavations should be flattened if sloughing occurs or seepage is present. Use of a trench shield or other approved temporary shoring is recommended if vertical walls are desired for cuts deeper than 4 feet bgs. If dewatering is used, we recommend that the type and design of the dewatering system be the responsibility of the contractor, who is in the best position to choose systems that fit the overall plan of operation.

5.3 Structural Fill

The extent of site grading is currently unknown; however, PBS estimates that fills may be on the order of up to 3 feet to raise the grades within the proposed site with cuts of less than 2 feet. Structural fill should be placed over subgrade that has been prepared in conformance with the Site Preparation and Wet/Freezing Weather

and Wet Soil Conditions sections of this report. Structural fill material should consist of relatively well-graded soil, or an approved rock product that is free of organic material and debris, and contains particles not greater than 4 inches nominal dimension.

The suitability of soil for use as compacted structural fill will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (material finer than the US Standard No. 200 Sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and compaction becomes more difficult to achieve. Soils containing more than about 5 percent fines cannot consistently be compacted to a dense, non-yielding condition when the water content is significantly greater (or significantly less) than optimum.

If fill and excavated material will be placed on slopes steeper than 5H:1V, these must be keyed/benched into the existing slopes and installed in horizontal lifts. Vertical steps between benches should be approximately 2 feet.

5.3.1 On-Site Soil

On-site clay soils encountered in our explorations are not generally suitable for placement as structural fill due to the moderate to high plasticity.

5.3.2 Borrow Material

Borrow material for general structural fill construction should meet the requirements set forth in ODOT SS 00330.12 – Borrow Material. When used as structural fill, borrow material should be placed in lifts with a maximum uncompacted thickness of approximately 8 inches and compacted to not less than 92 percent of the maximum dry density, as determined by ASTM D1557.

5.3.3 Select Granular Fill

Selected granular backfill used during periods of wet weather for structural fill construction should meet the specifications provided in ODOT SS 00330.14 – Selected Granular Backfill. The imported granular material should be uniformly moisture conditioned to within about 2 percent of the optimum moisture content and compacted in relatively thin lifts using suitable mechanical compaction equipment. Selected granular backfill should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557.

5.3.4 Crushed Aggregate Base

Crushed aggregate base course below floor slabs, spread footings, and asphalt concrete pavements should be clean crushed rock or crushed gravel that contains no deleterious materials and meets the specifications provided in ODOT SS 02630.10 – Dense-Graded Aggregate, and has less than 5 percent by dry weight passing the US Standard No. 200 Sieve. The crushed aggregate base course should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D1557.

5.3.5 Utility Trench Backfill

Pipe bedding placed to uniformly support the barrel of pipe should meet specifications provided in ODOT SS 00405.12 – Pipe Zone Bedding. The pipe zone that extends from the top of the bedding to at least 8 inches above utility lines should consist of material prescribed by ODOT SS 00405.13 – Pipe Zone Material. The pipe zone material should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer.

Under pavements, paths, slabs, or beneath building pads, the remainder of the trench backfill should consist of well-graded granular material with less than 10 percent by dry weight passing the US Standard No. 200 Sieve, and should meet standards prescribed by ODOT SS 00405.14 – Trench Backfill, Class B or D. This material should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D1557 or as required by the pipe manufacturer. The upper 2 feet of the trench backfill should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D1557. Controlled low-strength material (CLSM), ODOT SS 00405.14 – Trench Backfill, Class E, can be used as an alternative.

Outside of structural improvement areas (e.g., pavements, sidewalks, or building pads), trench material placed above the pipe zone may consist of general structural fill materials that are free of organics and meet ODOT SS 00405.14 – Trench Backfill, Class A. This general trench backfill should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer or local jurisdictions.

5.3.6 Stabilization Material

Stabilization rock should consist of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- or 6-inch-minus material with less than 5 percent passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. ODOT SS 00330.16 – Stone Embankment Material can be used as a general specification for this material with the stipulation of limiting the maximum size to 6 inches.

6 ADDITIONAL SERVICES AND CONSTRUCTION OBSERVATIONS

In most cases, other services beyond completion of a final geotechnical engineering report are necessary or desirable to complete the project. Occasionally, conditions or circumstances arise that require additional work that was not anticipated when the geotechnical report was written. PBS offers a range of environmental, geological, geotechnical, and construction services to suit the varying needs of our clients.

PBS should be retained to review the plans and specifications for this project before they are finalized. Such a review allows us to verify that our recommendations and concerns have been adequately addressed in the design.

Satisfactory earthwork performance depends on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. We recommend that PBS be retained to observe general excavation, stripping, fill placement, footing subgrades, and/or pile installation. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

7 LIMITATIONS

This report has been prepared for the exclusive use of the addressee, and their architects and engineers, for aiding in the design and construction of the proposed development and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without express written consent of the client and PBS. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.

The opinions, comments, and conclusions presented in this report are based upon information derived from our literature review, field explorations, laboratory testing, and engineering analyses. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. If soil, rock, or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that PBS is notified immediately so that we may reevaluate the recommendations of this report.

Unanticipated fill, soil and rock conditions, and seasonal soil moisture and groundwater variations are commonly encountered and cannot be fully determined by merely taking soil samples or completing explorations such as soil borings. Such variations may result in changes to our recommendations and may require additional funds for expenses to attain a properly constructed project; therefore, we recommend a contingency fund to accommodate such potential extra costs.

The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, this report should be reviewed to determine the applicability of the conclusions and recommendations presented herein. Land use, site conditions (both on and off site), or other factors may change over time and could materially affect our findings; therefore, this report should not be relied upon after three years from its issue, or in the event that the site conditions change.

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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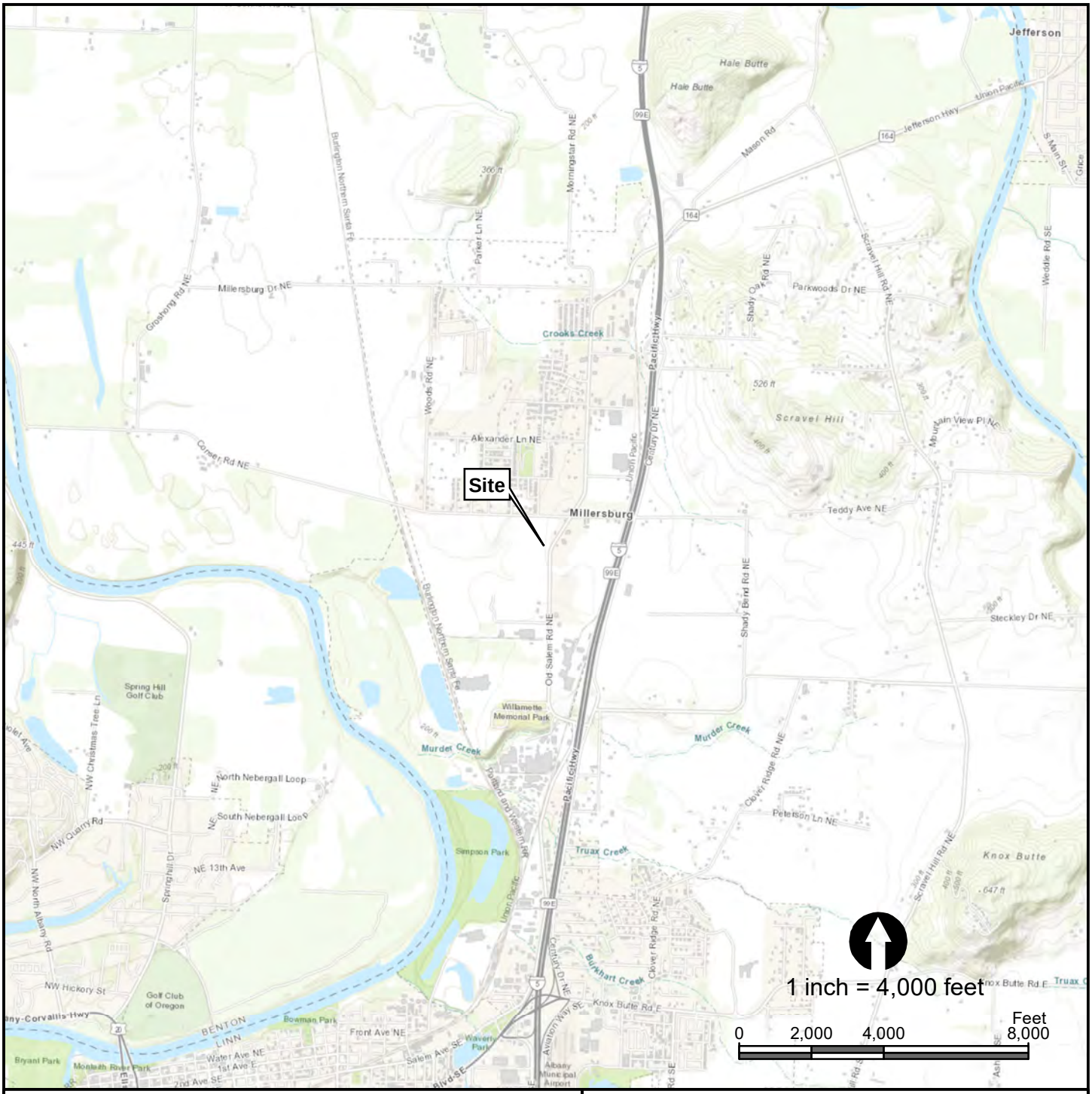
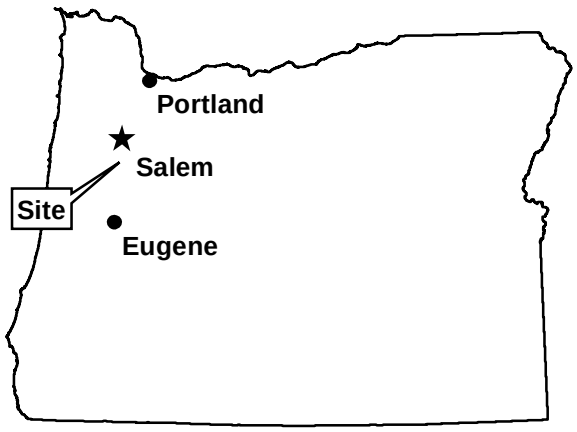
Figures





VICINITY MAP

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

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FIGURE
1

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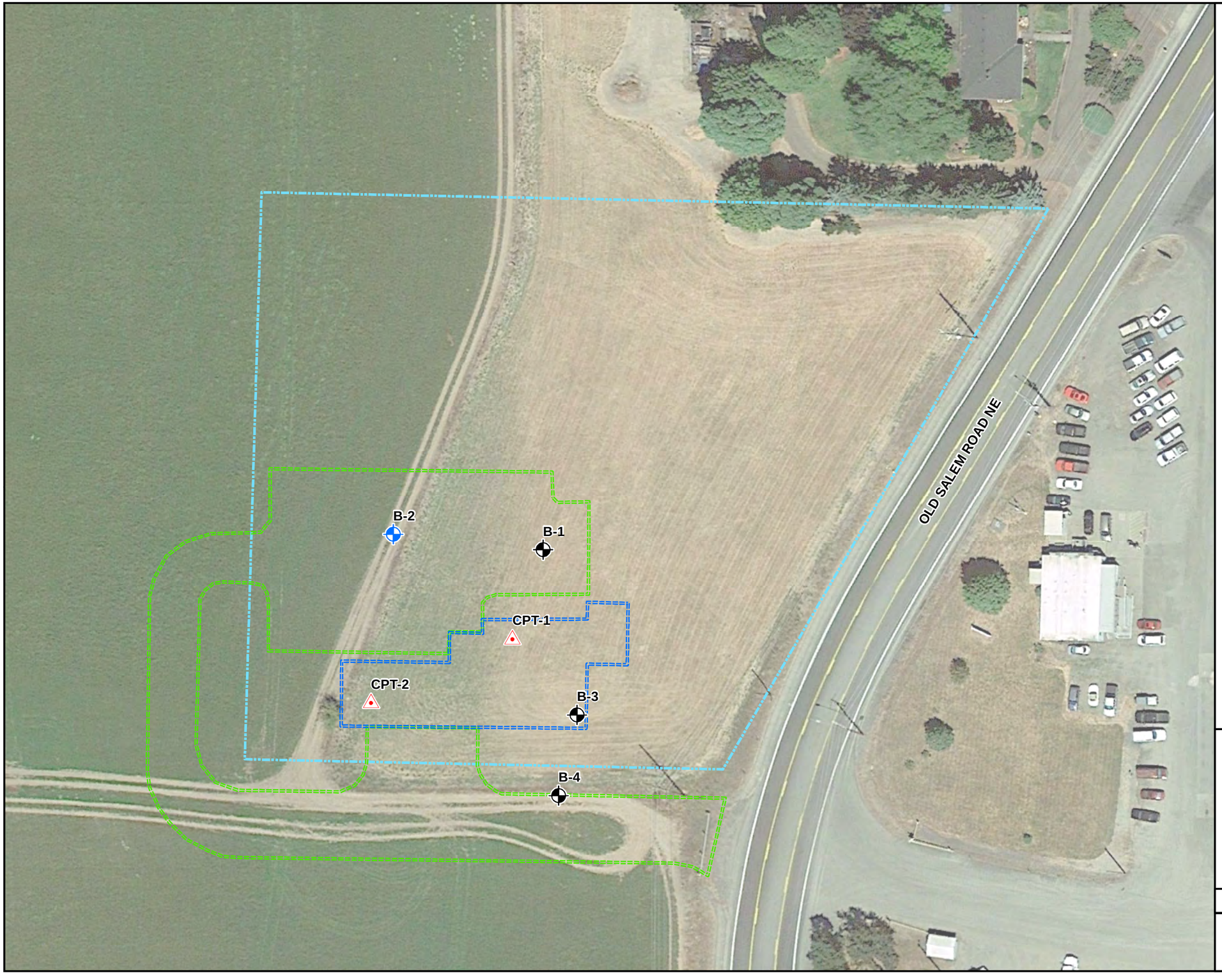

EXPLANATION

- B-1 - Boring name and approximate location
- B-2 - Boring name and approximate location with infiltration test
- CPT-1 - Cone pentration test
- Approximate area of planned fire station (Soderstrom Architects, 2020)
- Proposed paved areas
- Approximate property boundary

SOURCES: Google Earth 2018; Soderstrom Architects 2020

1 inch = 60 feet

0 30 60 Feet 120

SITE PLAN

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

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FIGURE
2

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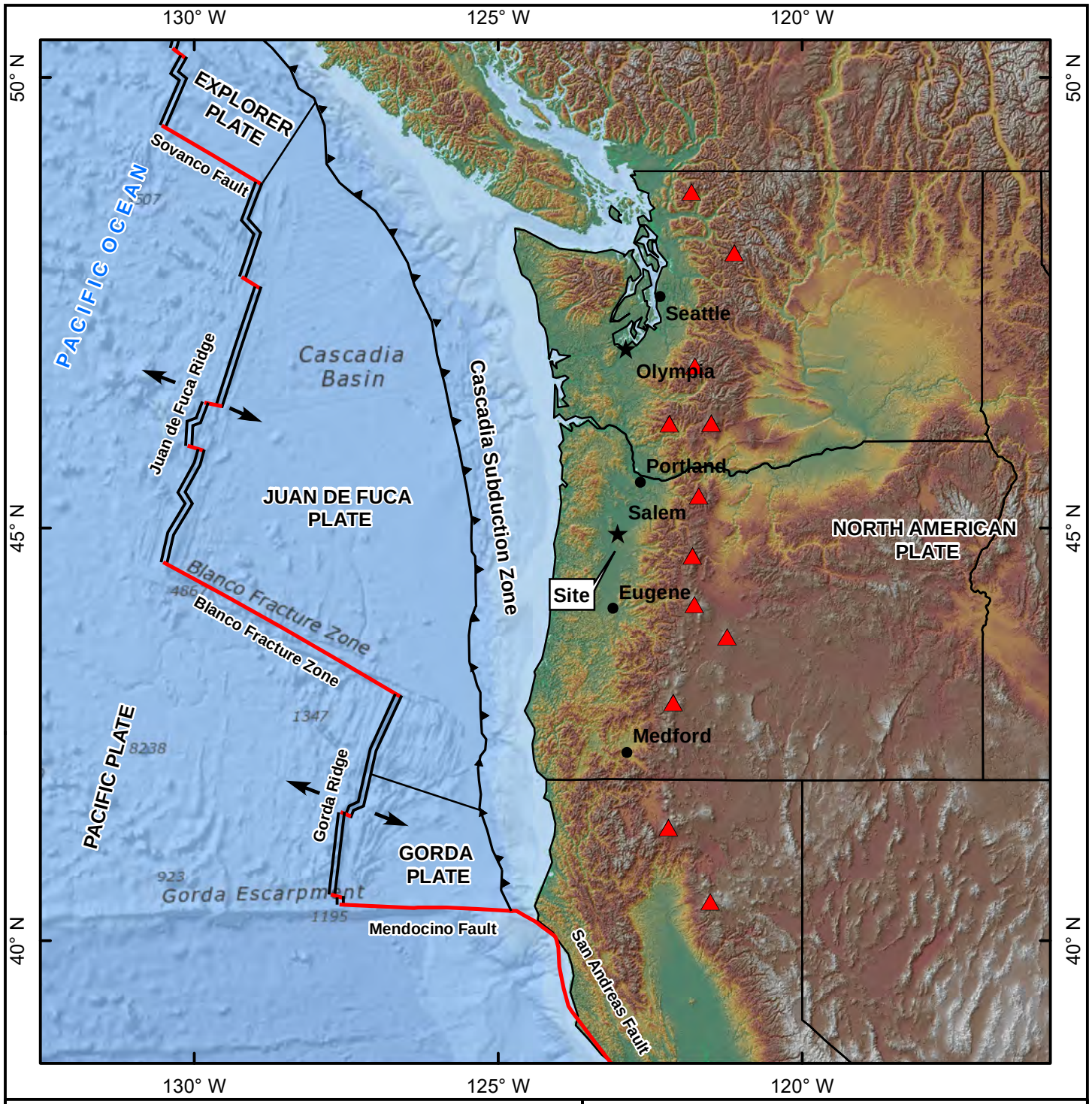

EXPLANATION

- Volcano
- Transform boundary
- Spreading ridge
- Thrust fault

Sources:
1) SRTM 30-meter DEM
2) ESRI World Oceans Basemap
3) USGS Tectonic Plate Boundaries

TECTONIC SETTING OF THE PACIFIC NORTHWEST

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

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FIGURE
3

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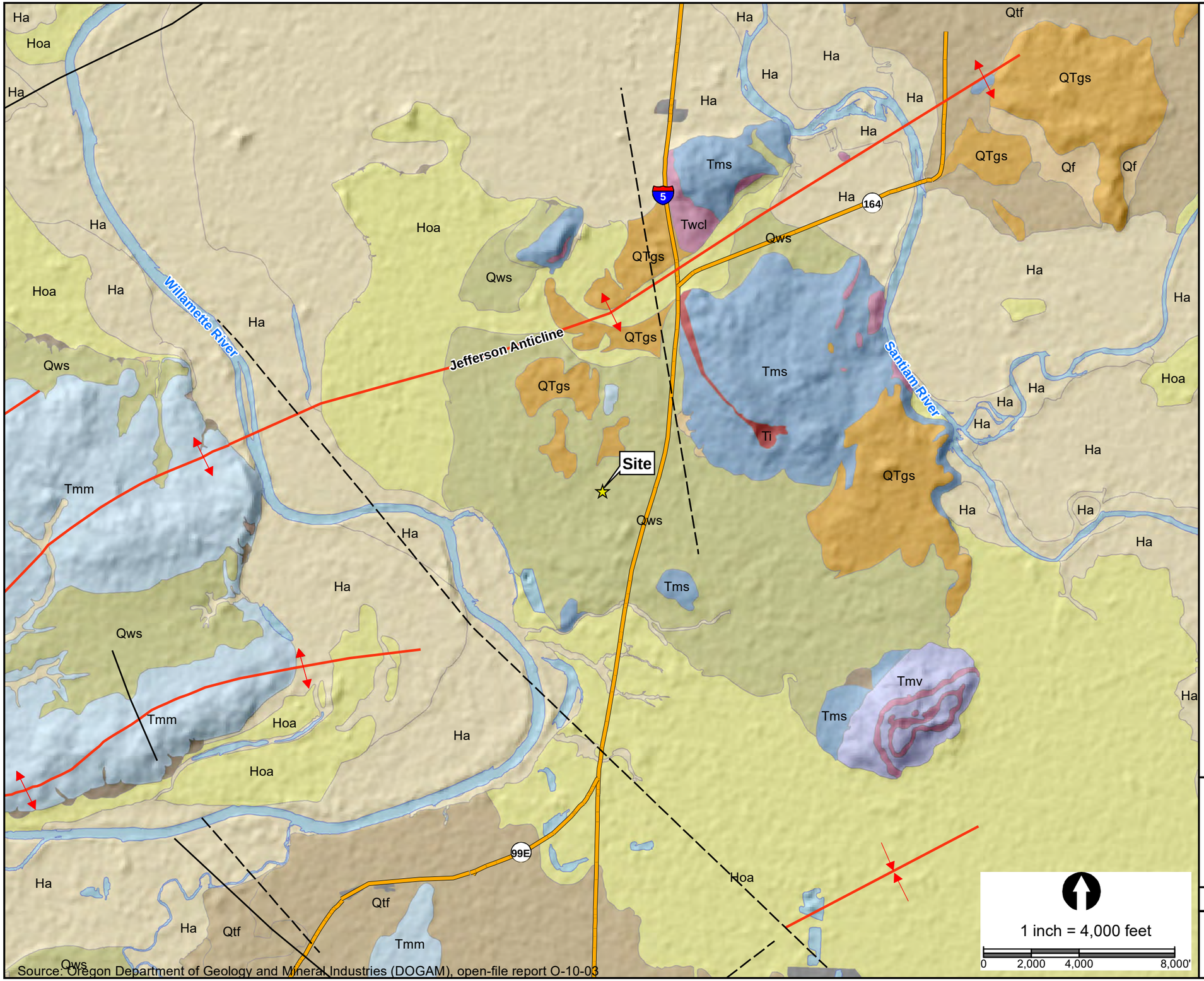

EXPLANATION

Quaternary Surficial Deposits

- Af — Artifical fill (Anthropocene)
- Ha — Alluvium (Holocene)
- Hoa — Older Alluvium (Holocene)
- Qws — Willamette Silt (upper Pleistocene)
- Qdf — Debris flow (Quaternary)
- QTgs — Weathered terrace gravels (Pleistocene and upper Pliocene)

Volcanic and Sedimentary Rocks of the Early Western Cascades

- Twcl — Early Western Cascades lavas (lower Miocene to middle Eocene)

Volcaniclastic Marine Sedimentary Rocks

- Tmm — Mixed source marine sedimentary rocks (middle Eocene)
- Tms — Siliciclastic marine sedimentary rocks (lower Oligocene to middle Eocene)
- Tmv — Volcaniclastic marine sedimentary rocks (lower Oligocene to lower Eocene)

Intrusive Rocks

- Ti — Intrusive rocks (middle Miocene to upper Eocene)

Fault - solid where known; dashed where questionable

Anticline or Syncline

1 inch = 4,000 feet

0 2,000 4,000 8,000'

GEOLOGIC MAP

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

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FIGURE 4

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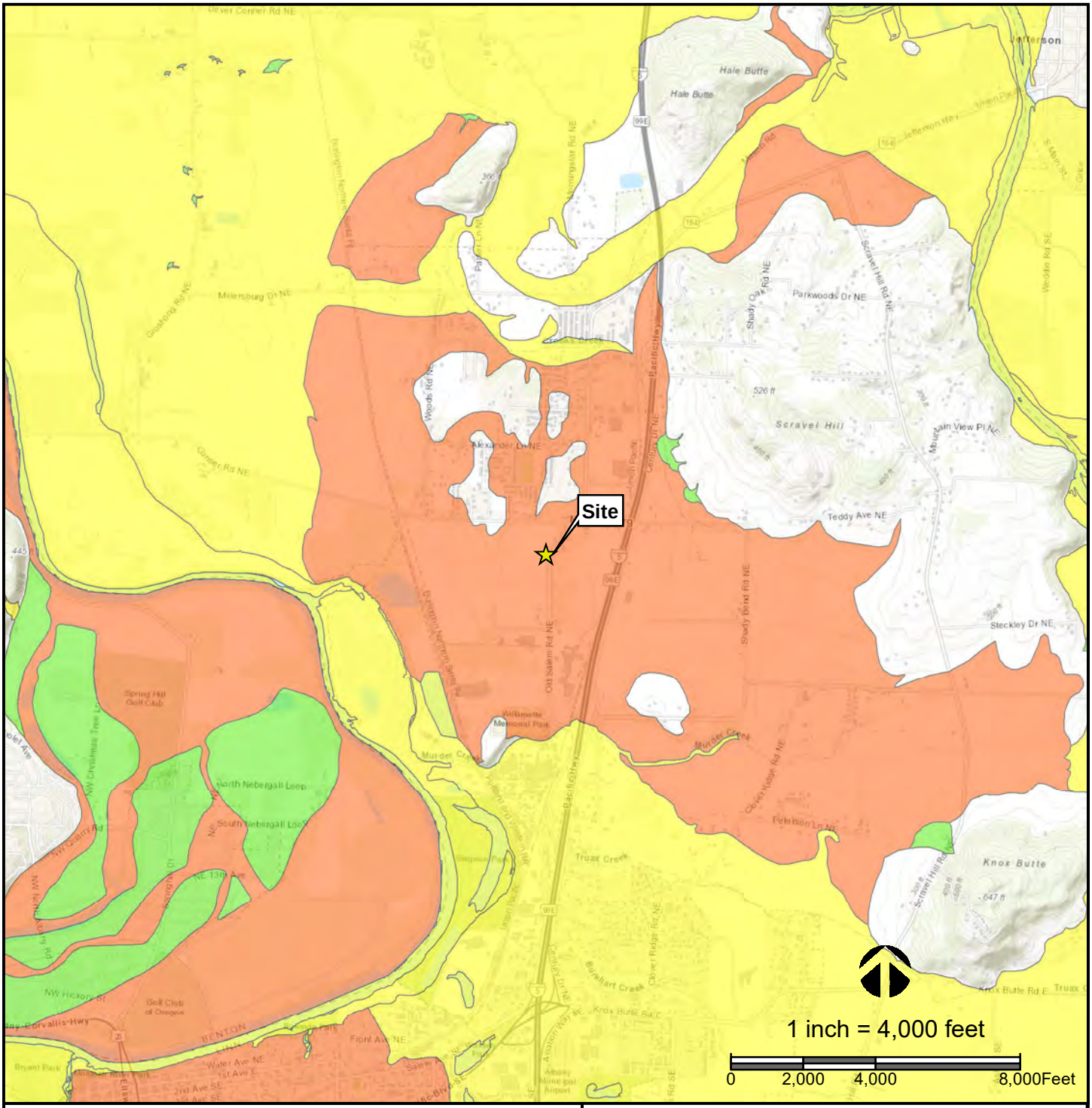


EXPLANATION

Liquefaction Susceptibility (DOGAMI O-13-06)

- Very low
- Low
- Moderate
- High
- Very high
- ☆ Site

Sources: ESRI Imagery

LIQUEFACTION SUSCEPTIBILITY MAP

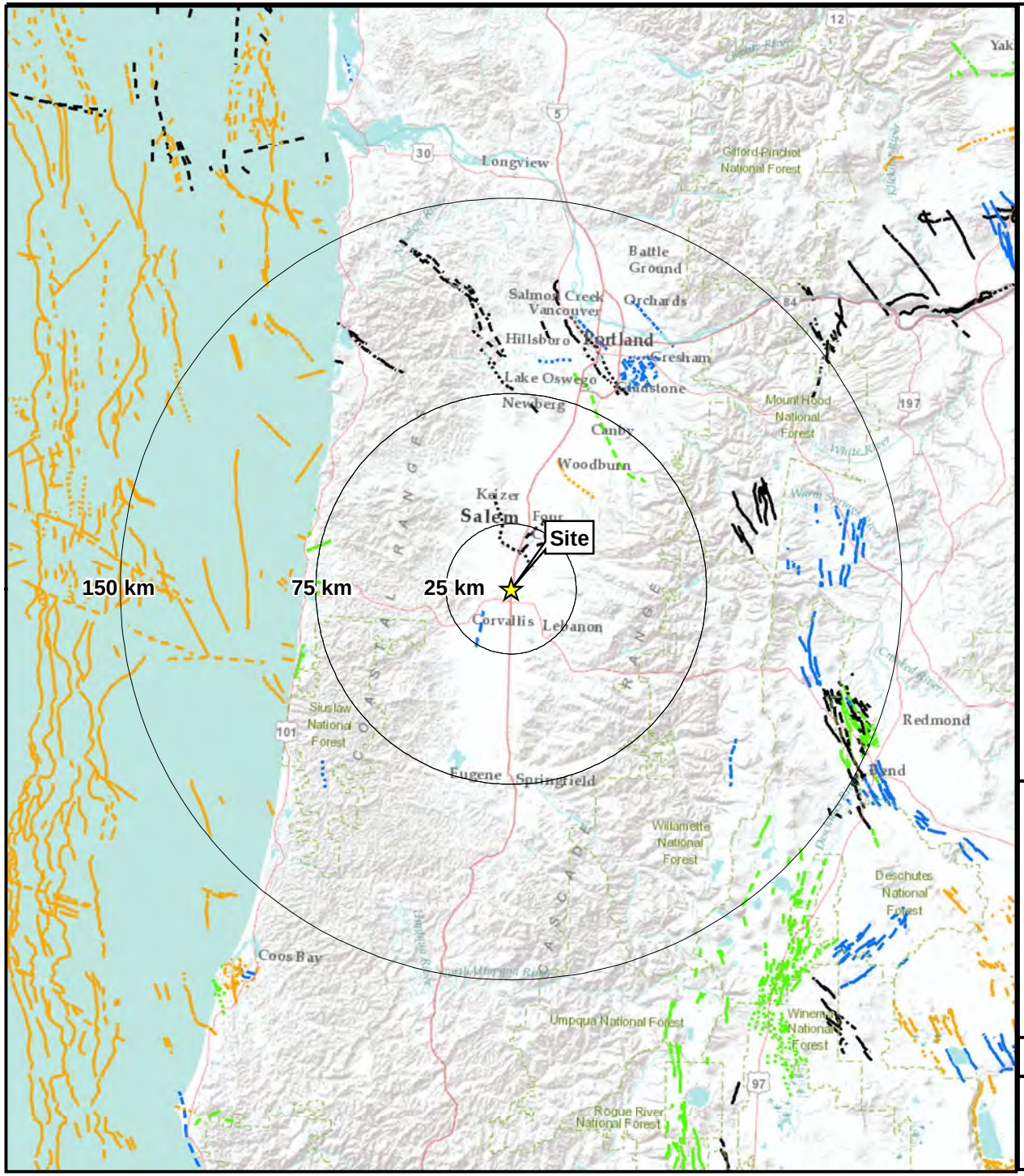
MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

PBS

FIGURE
5

L:\Gis\GEOTECH\project\17846.000\fig_05_OR_Liquefaction_O-13-06.mxd



L:\Gis\GEOTECH\project\17846.000\fig_6_Faults.mxd

EXPLANATION

☆ Site location

USGS (2006) Quaternary fault traces; solid where well constrained, dashed where moderately constrained, and dotted where inferred

- < 15,000 years - latest Quaternary
- < 130,000 years - late Quaternary
- < 750,000 years - middle and late Quaternary
- < 1.6 million years - undifferentiated Quaternary

1 inch = 60 kilometers

0 15 30 60km

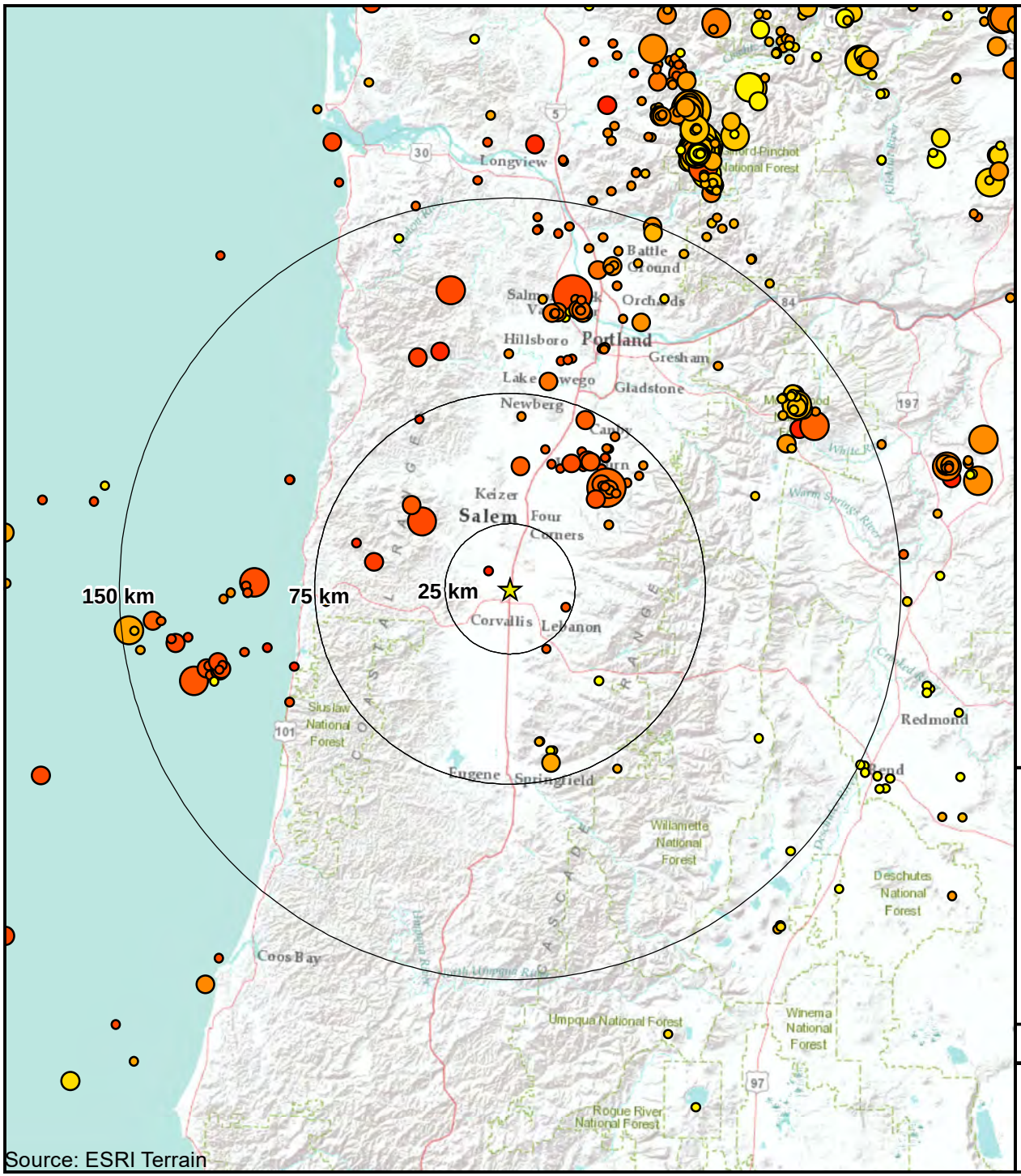
REGIONAL FAULT MAP

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

PBS

FIGURE
6



EXPLANATION

☆ Site location

Independent Seismicity (1963-2017)

- M 2.5 - 3.0
- M 3.1 - 4.0
- M 4.1 - 5.0
- M >5.1

Depth in kilometers (km)

Low : 0 km

High: 100 km

1 inch = 60 kilometers

0 15 30 60km

HISTORICAL SEISMICITY

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

DATE: AUG 2020 · PROJECT: 17846.000

PBS

FIGURE

7

L:\Gis\GEOTECH\project\17846.000\fig_7_Seismicity.mxd

Appendix A
Field Explorations

Appendix A: Field Explorations

A1 GENERAL

PBS explored subsurface conditions at the project site by advancing four borings to depths of up to approximately 51.5 feet bgs on June 26, 2020, and two cone penetration tests (CPTs) to depths of up to 68 feet bgs on June 23, 2020. The approximate locations of the explorations are shown on Figure 2, Site Plan. The procedures used to advance the borings and CPTs, collect samples, and other field techniques are described in detail in the following paragraphs. Unless otherwise noted, all soil sampling and classification procedures followed engineering practices in general accordance with relevant ASTM procedures. "General accordance" means that certain local drilling/excavation and descriptive practices and methodologies have been followed.

A2 BORINGS

A2.1 Drilling

Borings were advanced using a track-mounted CME-75 drill rig provided and operated by Holt Services, Inc., of Vancouver, Washington. Borings B-1, B-3, and B-4 were advanced using mud rotary drilling techniques. Boring B-2 was advanced using hollow-stem auger drilling techniques for the purpose of infiltration testing. The borings were observed by a member of the PBS geotechnical staff, who maintained a detailed log of the subsurface conditions and materials encountered during the course of the work.

A2.2 Sampling

Disturbed soil samples were taken in the borings at selected depth intervals. The samples were obtained using a standard 2-inch outside diameter, split-spoon sampler following procedures prescribed for the standard penetration test (SPT). Using the SPT, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance (N-value). The N-value provides a measure of the relative density of granular soils such as sands and gravels, and the consistency of cohesive soils such as clays and plastic silts. The disturbed soil samples were examined by a member of the PBS geotechnical staff and then sealed in plastic bags for further examination and physical testing in our laboratory.

A2.3 Boring Logs

The boring logs show the various types of materials that were encountered in the borings and the depths where the materials and/or characteristics of these materials changed, although the changes may be gradual. Where material types and descriptions changed between samples, the contacts were interpreted. The types of samples taken during drilling, along with their sample identification number, are shown to the right of the classification of materials. The N-values and natural water (moisture) contents are shown farther to the right.

A3 CONE PENETRATION TESTS (CPT)

A3.1 Field Procedures

Two CPT probes were advanced using a 20-ton truck mounted with a Vertek CPT 10 cm^2 electric seismic piezo cone owned and operated by Geotechnical Explorations, Inc., of Keizer, Oregon. During the test, the instrumented cone is hydraulically pushed into the ground at the rate of about 2 centimeters per second (cm/s), and readings of cone tip resistance, sleeve friction, and pore pressure are digitally recorded every second. As the cone advances, additional cone rods are added such that a "string" of rods continuously advances through the soil. As the test progresses, the CPT operator monitors the cone resistance and its deviation from vertical alignment.

For CPT soundings in which seismic data were collected, conventional CPT testing is temporarily halted at 2-meter intervals to collect seismic data. A seismograph integrated with the CPT is used to record the arrival time of seismic waves generated by striking a steel beam positioned at least 10 feet from the cone rods and

coupled to the ground surface by the weight of the beam and operator to prevent the beam from moving when struck.

Each side of the beam is struck several times, and each signal produced by a blow is closely examined for signal and noise content, after which the waveform is selected and the arrival time of the shear wave is determined and recorded. After a complete set of seismic data are recorded, the cone is advanced to the next depth, and the procedure is repeated until the hole is complete.

A3.2 CPT Logs

In accordance with the applicable ASTM standard, the vertical axis is designated for the depth, while the horizontal axis displays the magnitude of the test values recorded. Recorded values include tip and shaft resistance and pore pressure. Final plotting scales are determined after all the tests are complete and take into consideration maximum test values and depths recorded for the project. This information is used to calculate the friction ratio and is correlated to material types, which are presented graphically in a column to the right. The CPT logs are included as Figures A5 and A6. The results of shear wave velocity testing are included on Figure A7.

A4 MATERIAL DESCRIPTION

Initially, samples were classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. Afterward, the samples were reexamined in the PBS laboratory, various standard classification tests were conducted, and the field classifications were modified where necessary. The terminology used in the soil classifications and other modifiers are defined in Table A-1, Terminology Used to Describe Soil.

Table A-1
Terminology Used to Describe Soil

Soil Descriptions

Soils exist in mixtures with varying proportions of components. The predominant soil, i.e., greater than 50 percent based on total dry weight, is the primary soil type and is capitalized in our log descriptions (SAND, GRAVEL, SILT, or CLAY). Smaller percentages of other constituents in the soil mixture are indicated by use of modifier words in general accordance with the ASTM D2488-06 Visual-Manual Procedure. "General Accordance" means that certain local and common descriptive practices may have been followed. In accordance with ASTM D2488-06, group symbols (such as GP or CH) are applied on the portion of soil passing the 3-inch (75mm) sieve based on visual examination. The following describes the use of soil names and modifying terms used to describe fine- and coarse-grained soils.

Fine-Grained Soils (50% or greater fines passing 0.075 mm, No. 200 sieve)
The primary soil type, i.e., SILT or CLAY is designated through visual-manual procedures to evaluate soil toughness, dilatency, dry strength, and plasticity. The following outlines the terminology used to describe fine-grained soils, and varies from ASTM D2488 terminology in the use of some common terms.

Primary soil NAME, Symbols, and Adjectives			Plasticity Description	Plasticity Index (PI)
SILT (ML & MH)	**CLAY (CL & CH)**	**ORGANIC SOIL (OL & OH)**		
SILT		Organic SILT	Non-plastic	0 – 3
SILT		Organic SILT	Low plasticity	4 – 10
SILT/Elastic SILT	Lean CLAY	Organic SILT/ Organic CLAY	Medium Plasticity	10 – 20
Elastic SILT	Lean/Fat CLAY	Organic CLAY	High Plasticity	20 – 40
Elastic SILT	Fat CLAY	Organic CLAY	Very Plastic	>40

Modifying terms describing secondary constituents, estimated to 5 percent increments, are applied as follows:

Description	% Composition	
With Sand	% Sand ≥ % Gravel	15% to 25% plus No. 200
With Gravel	% Sand < % Gravel	
Sandy	% Sand ≥ % Gravel	≤30% to 50% plus No. 200
Gravelly	% Sand < % Gravel	

Borderline Symbols, for example CH/MH, are used when soils are not distinctly in one category or when variable soil units contain more than one soil type. **Dual Symbols,** for example CL-ML, are used when two symbols are required in accordance with ASTM D2488.

Soil Consistency terms are applied to fine-grained, plastic soils (i.e., PI ≥ 7). Descriptive terms are based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84, as follows. SILT soils with low to non-plastic behavior (i.e., PI < 7) may be classified using relative density.

Consistency Term	SPT N-value	Unconfined Compressive Strength	
		tsf	kPa
Very soft	Less than 2	Less than 0.25	Less than 24
Soft	2 – 4	0.25 – 0.5	24 – 48
Medium stiff	5 – 8	0.5 – 1.0	48 – 96
Stiff	9 – 15	1.0 – 2.0	96 – 192
Very stiff	16 – 30	2.0 – 4.0	192 – 383
Hard	Over 30	Over 4.0	Over 383

Soil Descriptions

Coarse - Grained Soils (less than 50% fines)

Coarse-grained soil descriptions, i.e., SAND or GRAVEL, are based on the portion of materials passing a 3-inch (75mm) sieve. Coarse-grained soil group symbols are applied in accordance with ASTM D2488-06 based on the degree of grading, or distribution of grain sizes of the soil. For example, well-graded sand containing a wide range of grain sizes is designated SW; poorly graded gravel, GP, contains high percentages of only certain grain sizes. Terms applied to grain sizes follow.

Material NAME	Particle Diameter	
	Inches	Millimeters
SAND (SW or SP)	0.003 – 0.19	0.075 – 4.8
GRAVEL (GW or GP)	0.19 – 3	4.8 – 75
Additional Constituents:		
Cobble	3 – 12	75 – 300
Boulder	12 – 120	300 – 3050

The primary soil type is capitalized, and the fines content in the soil are described as indicated by the following examples. Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 percent. Other soil mixtures will have similar descriptive names.

Example: Coarse-Grained Soil Descriptions with Fines

>5% to < 15% fines (Dual Symbols)	≥15% to < 50% fines
Well graded GRAVEL with silt: GW-GM	Silty GRAVEL: GM
Poorly graded SAND with clay: SP-SC	Silty SAND: SM

Additional descriptive terminology applied to coarse-grained soils follow.

Example: Coarse-Grained Soil Descriptions with Other Coarse-Grained Constituents

Coarse-Grained Soil Containing Secondary Constituents	
With sand or with gravel	≥ 15% sand or gravel
With cobbles; with boulders	Any amount of cobbles or boulders.

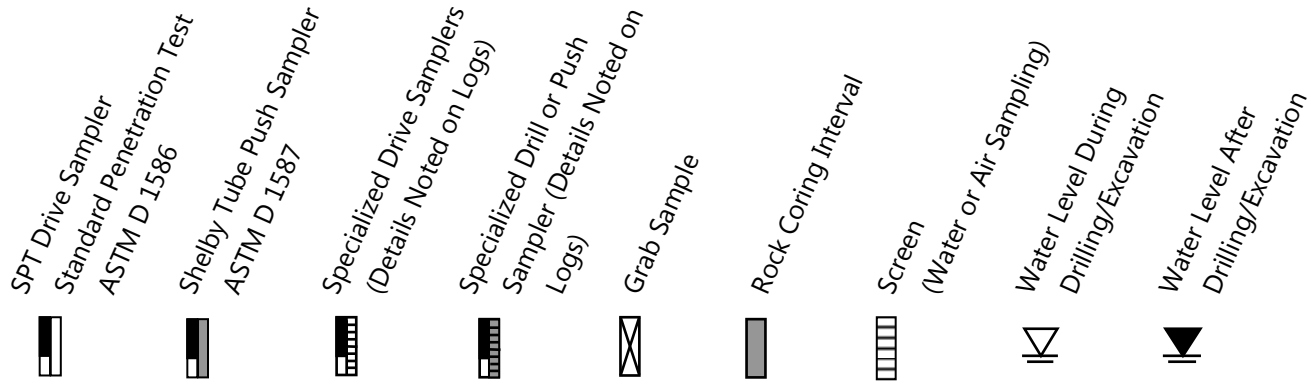
Cobble and boulder deposits may include a description of the matrix soils, as defined above.

Relative Density terms are applied to granular, non-plastic soils based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84.

Relative Density Term	SPT N-value
Very loose	0 – 4
Loose	5 – 10
Medium dense	11 – 30
Dense	31 – 50
Very dense	> 50

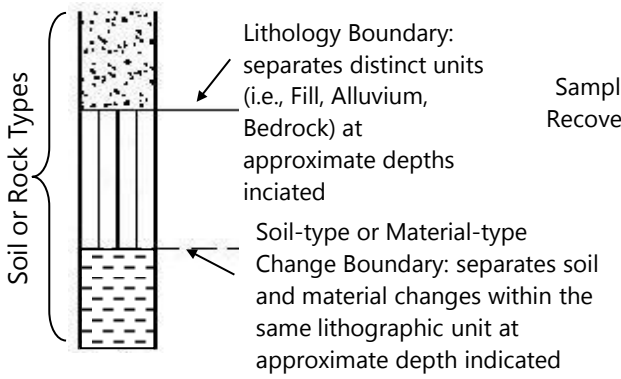
Table A-2
Key To Test Pit and Boring Log Symbols

SAMPLING DESCRIPTIONS

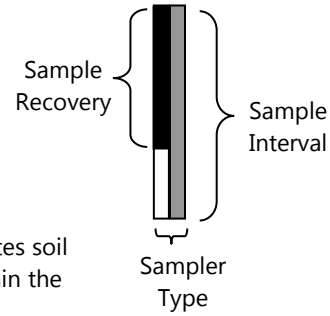


LOG GRAPHICS

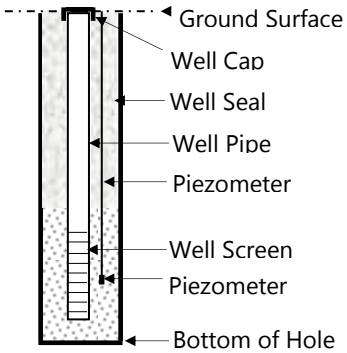
Soil and Rock



Sampling Symbols



Instrumentation Detail

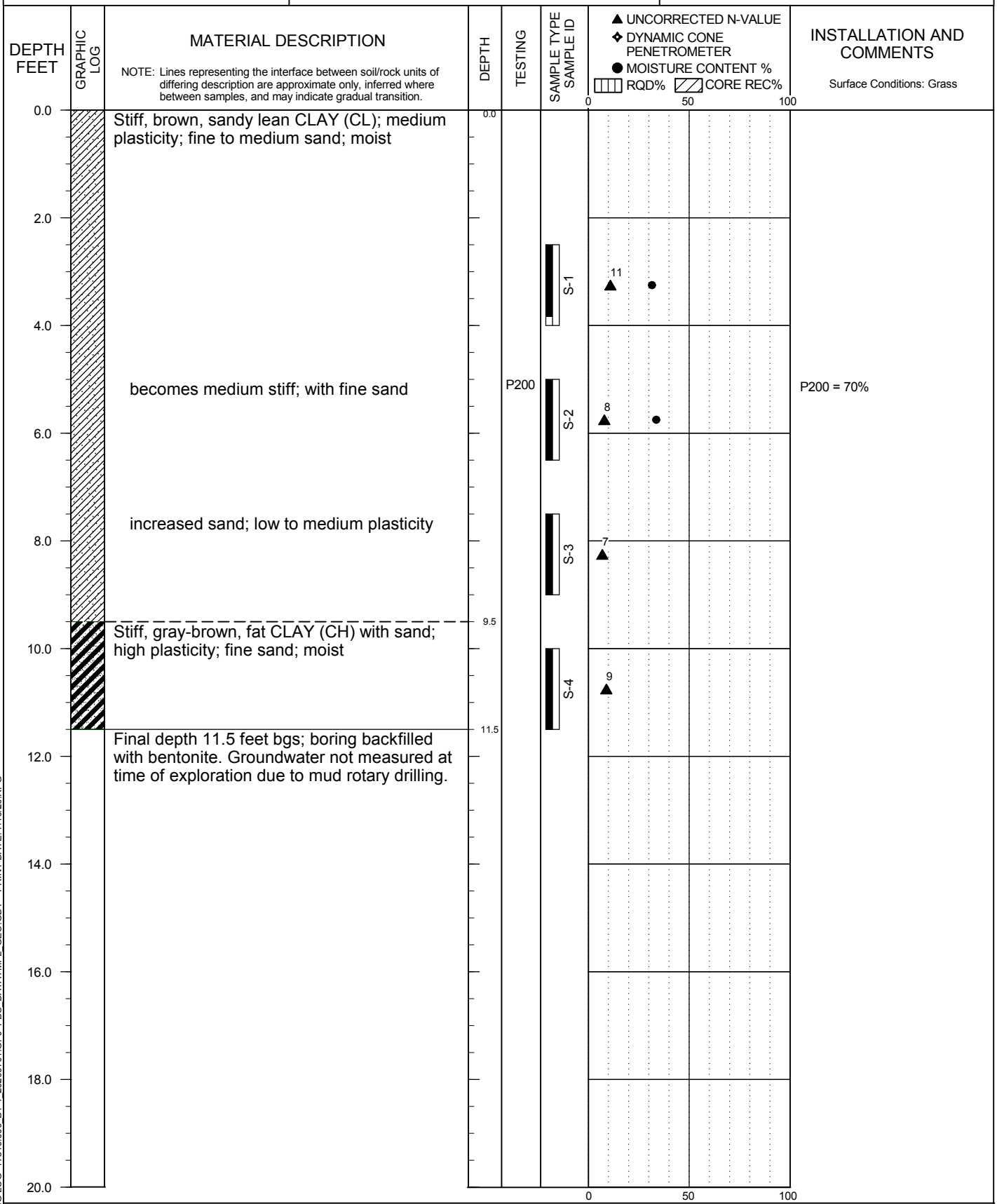


Geotechnical Testing Acronym Explanations

PP	Pocket Penetrometer	HYD	Hydrometer Gradation
TOR	Torvane	SIEV	Sieve Gradation
DCP	Dynamic Cone Penetrometer	DS	Direct Shear
ATT	Atterberg Limits	DD	Dry Density
PL	Plasticity Limit	CBR	California Bearing Ratio
LL	Liquid Limit	RES	Resilient Modulus
PI	Plasticity Index	VS	Vane Shear
P200	Percent Passing US Standard No. 200 Sieve	bgs	Below ground surface
OC	Organic Content	MSL	Mean Sea Level
CON	Consolidation	HCL	Hydrochloric Acid
UC	Unconfined Compressive Strength		

Details of soil and rock classification systems are available on request.

PBS	MILLERSBURG FIRE STATION MILLERSBURG, OREGON	**BORING B-1**
	PBS PROJECT NUMBER: 17846.000	APPROX. BORING B-1 LOCATION: 44.679078, -123.063209



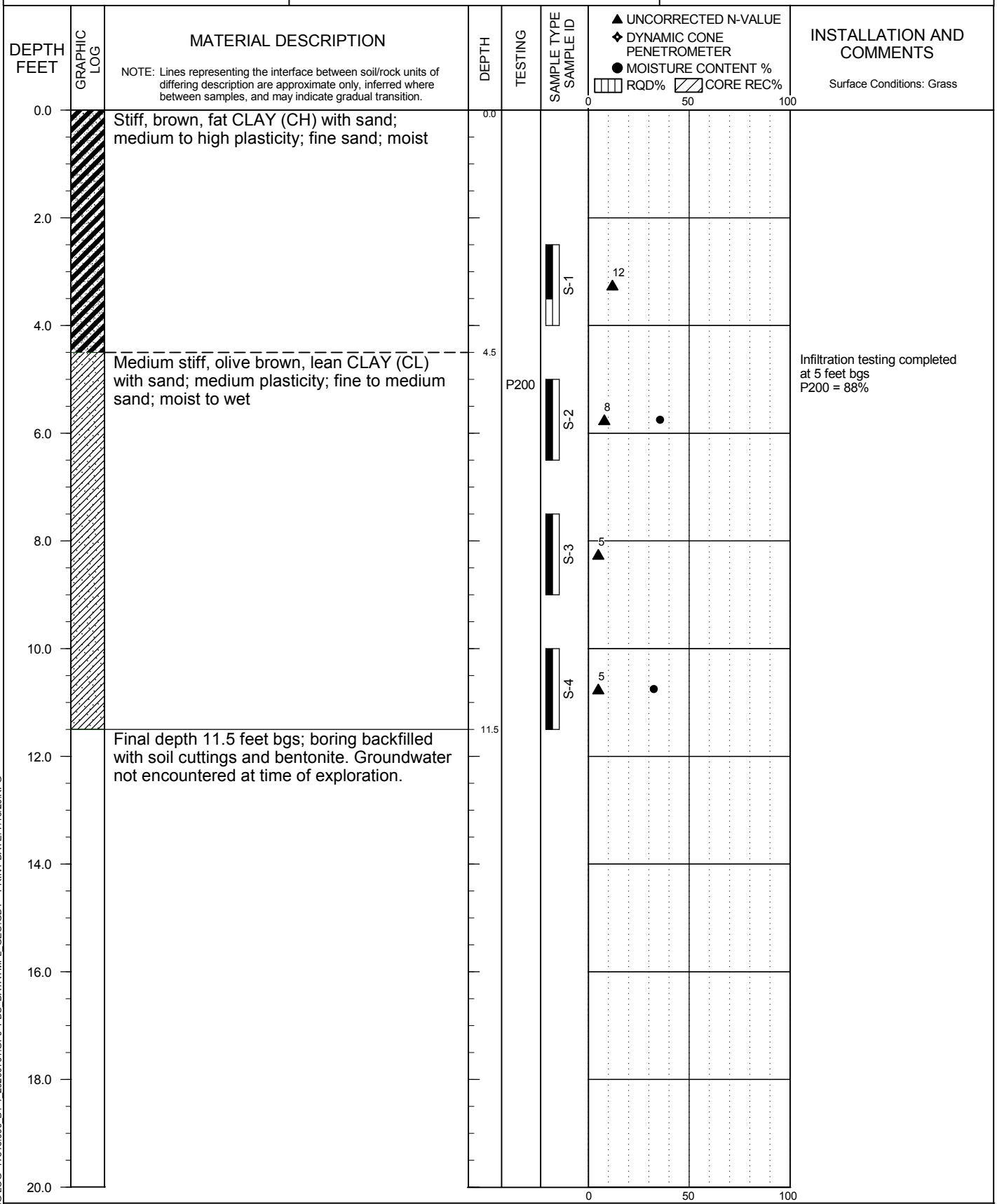
DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 4 7/8 inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/25/2020

FIGURE A1
Page 1 of 1

BORING LOG 17846.000_B1-4_20200701.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 7/10/20 RPG

PBS	MILLERSBURG FIRE STATION MILLERSBURG, OREGON	**BORING B-2**
	PBS PROJECT NUMBER: 17846.000	APPROX. BORING B-2 LOCATION: 44.679072, -123.063655



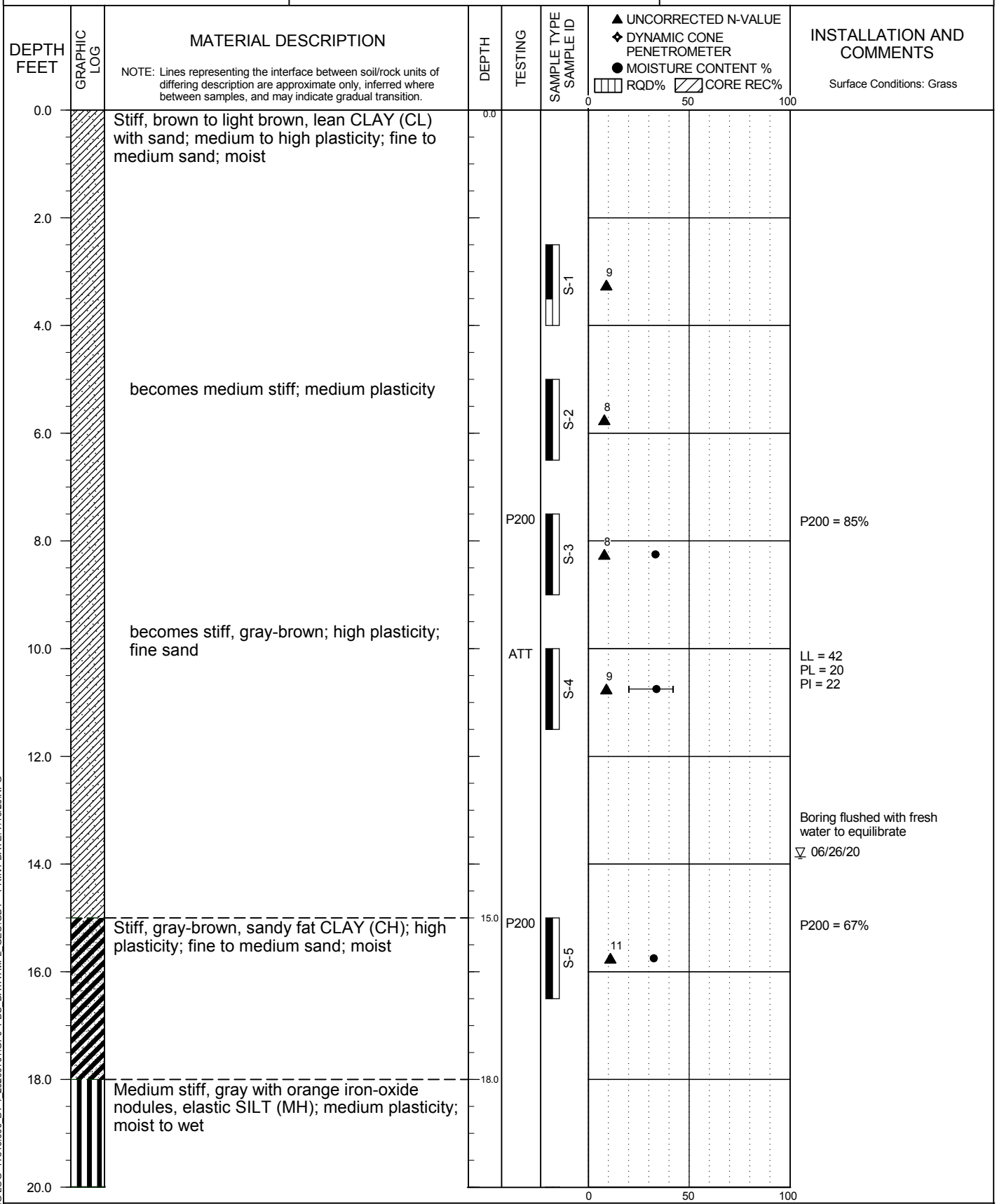
BORING LOG 17846.000 B1-4 20200701.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 7/10/20 RPG

DRILLING METHOD: Hollow-Stem Auger
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 6 ¼ inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/25/2020

FIGURE A2

PBS	MILLERSBURG FIRE STATION MILLERSBURG, OREGON	**BORING B-3**
	PBS PROJECT NUMBER: 17846.000	APPROX. BORING B-3 LOCATION: 44.678693, -123.063243



BORING LOG 17846.000 B1-4 20200701.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 7/10/20 RPG

DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 4 7/8 inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/26/2020

FIGURE A3

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

PBS PROJECT NUMBER:
17846.000

BORING B-3
(continued)

APPROX. BORING B-3 LOCATION:
44.678693, -123.063243

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	UNCORRECTED N-VALUE / DYNAMIC CONE PENETROMETER / MOISTURE CONTENT % / RQD% / CORE REC%	INSTALLATION AND COMMENTS
20.0		Medium stiff, gray with orange iron-oxide nodules, elastic SILT (MH); medium plasticity; moist to wet	20.0		S-6	7	Surface Conditions: Grass
22.0							
		Stiff, blue-gray with orange iron-oxide nodules, fat CLAY (CH); high plasticity; moist	23.0				
24.0				ATT	S-7	11	LL = 69 PL = 31 PI = 38
26.0							
28.0		Medium stiff, blue-gray with orange iron-oxide nodules, elastic SILT (MH); medium plasticity; moist to wet	28.0				
30.0					S-8	14	
		Medium dense, gray to orange, silty SAND (SM); non-plastic; fine to medium sand; wet	31.0				
32.0							
		Very stiff, blue-gray, sandy lean CLAY (CL); low plasticity; fine to medium sand; moist	33.0				
34.0				P200	S-9	23	P200 = 54%
36.0							
38.0							
40.0							

0 50 100

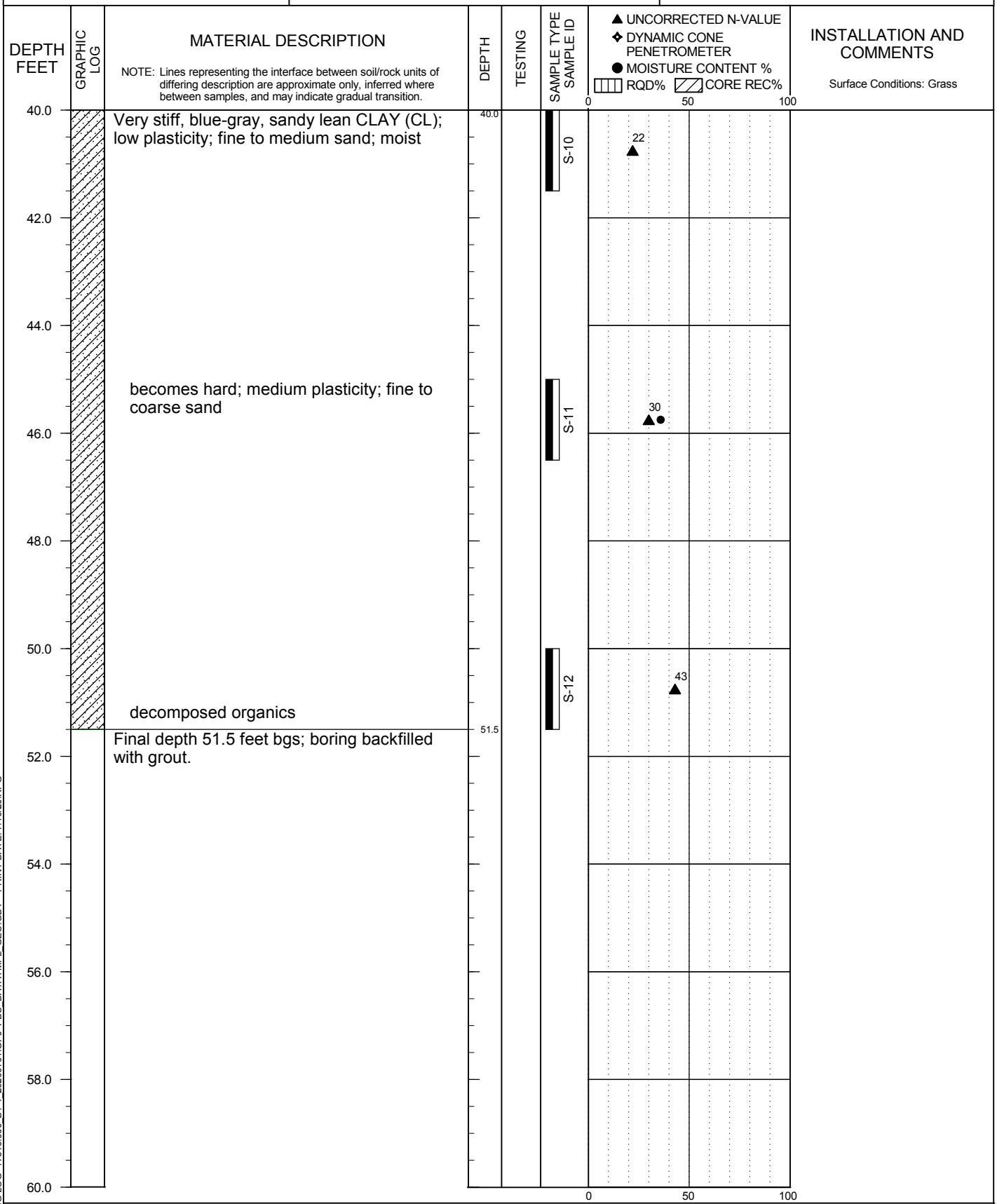
BORING LOG 17846.000_B1-4_20200701.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 7/10/20 RPG

DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 4 7/8 inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/26/2020

FIGURE A3

PBS	MILLERSBURG FIRE STATION MILLERSBURG, OREGON	**BORING B-3** (continued)
	PBS PROJECT NUMBER: 17846.000	APPROX. BORING B-3 LOCATION: 44.678693, -123.063243

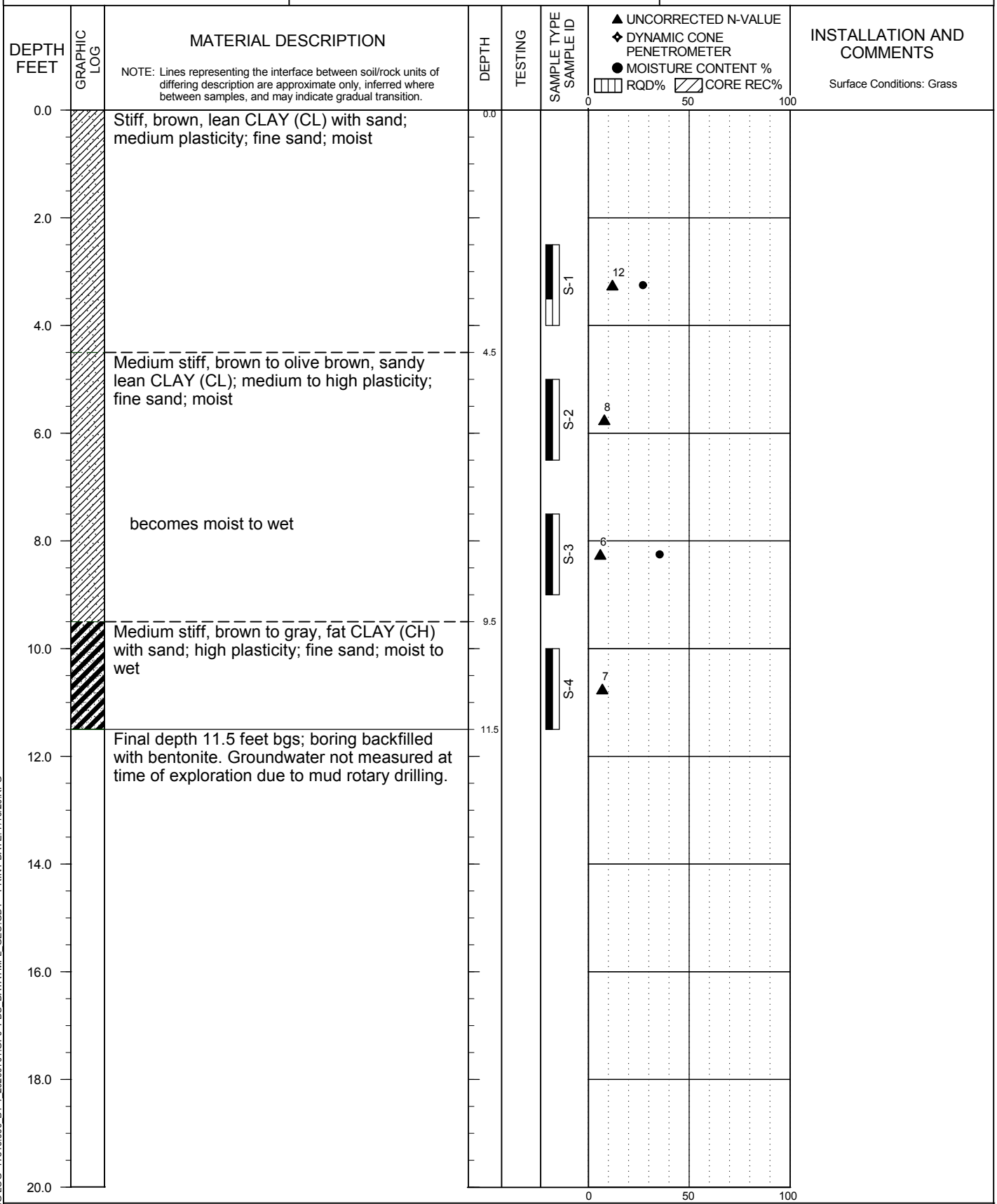


DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 4 7/8 inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/26/2020

FIGURE A3

PBS	MILLERSBURG FIRE STATION MILLERSBURG, OREGON	**BORING B-4**
	PBS PROJECT NUMBER: 17846.000	APPROX. BORING B-4 LOCATION: 44.678536, -123.063285



DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: D. Eibert

BIT DIAMETER: 4 7/8 inches
HAMMER EFFICIENCY PERCENT: 86.5
LOGGING COMPLETED: 6/25/2020

FIGURE A4
Page 1 of 1

BORING LOG 17846.000_B1-4_20200701.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 7/10/20 RPG

PBS Engineering and Environmental, Inc.
4412 S Corbett Avenue
Portland, Oregon 97239
www.pbsusa.com

CPT-1
Total depth: 41.83 ft, Date: 6/23/2020

Project: **17846.000 Millersburg Fire Station**
Location: **Millersburg, Oregon**

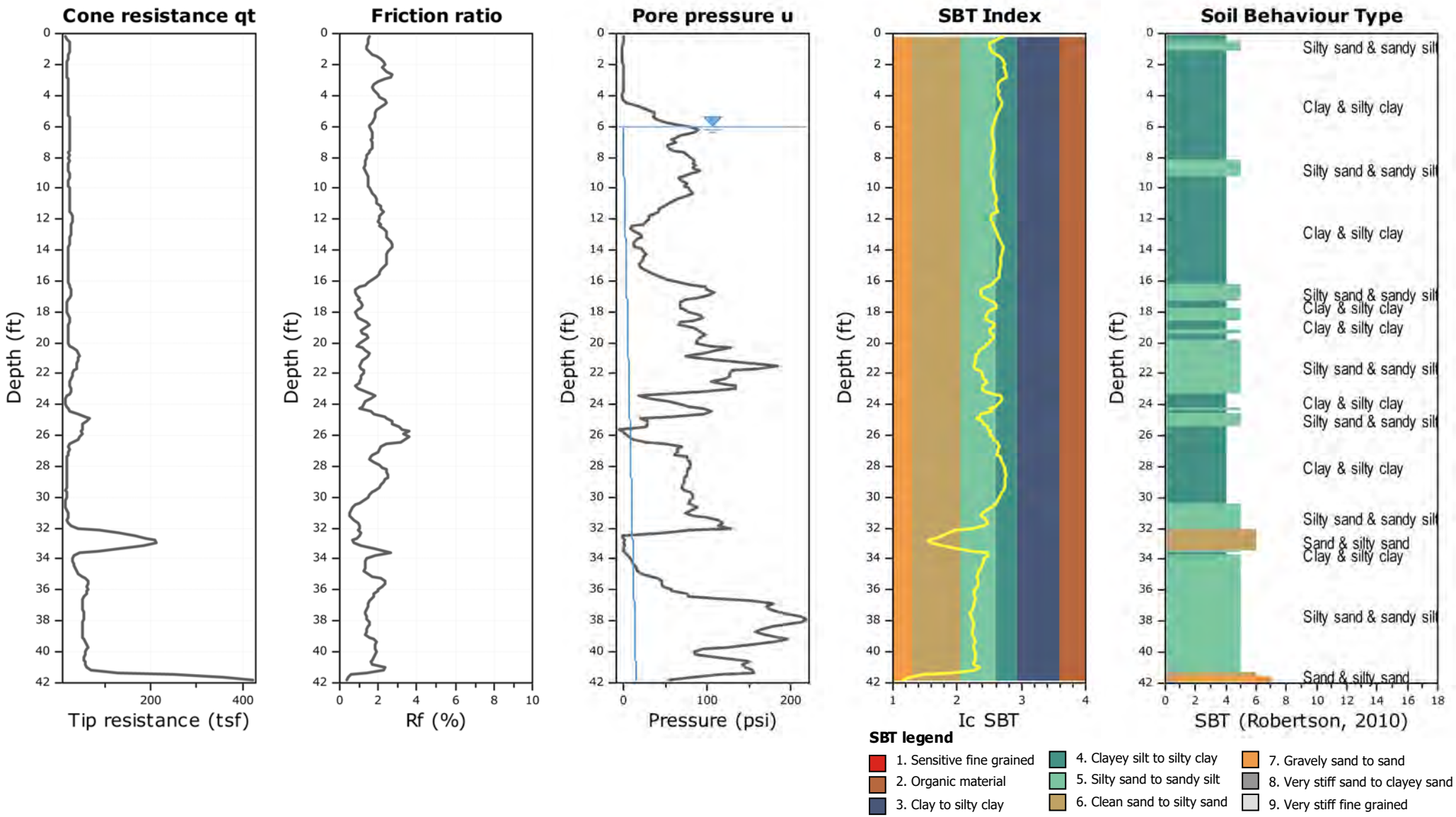


FIGURE A5

PBS Engineering and Environmental, Inc.
4412 S Corbett Avenue
Portland, Oregon 97239
www.pbsusa.com

CPT-2
Total depth: 67.91 ft, Date: 6/23/2020

Project: **17846.000 Millersburg Fire Station**
Location: **Millersburg, Oregon**

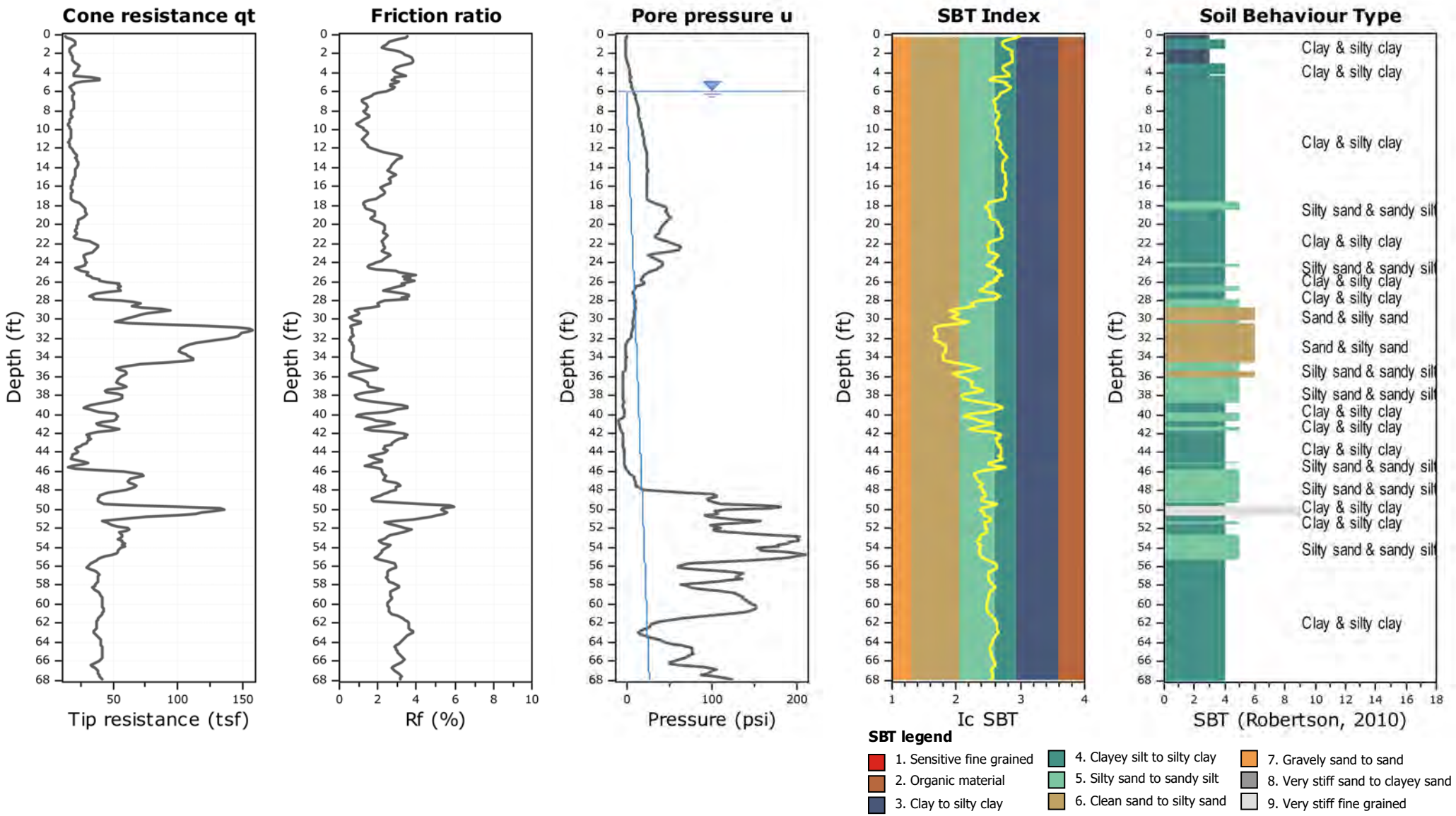
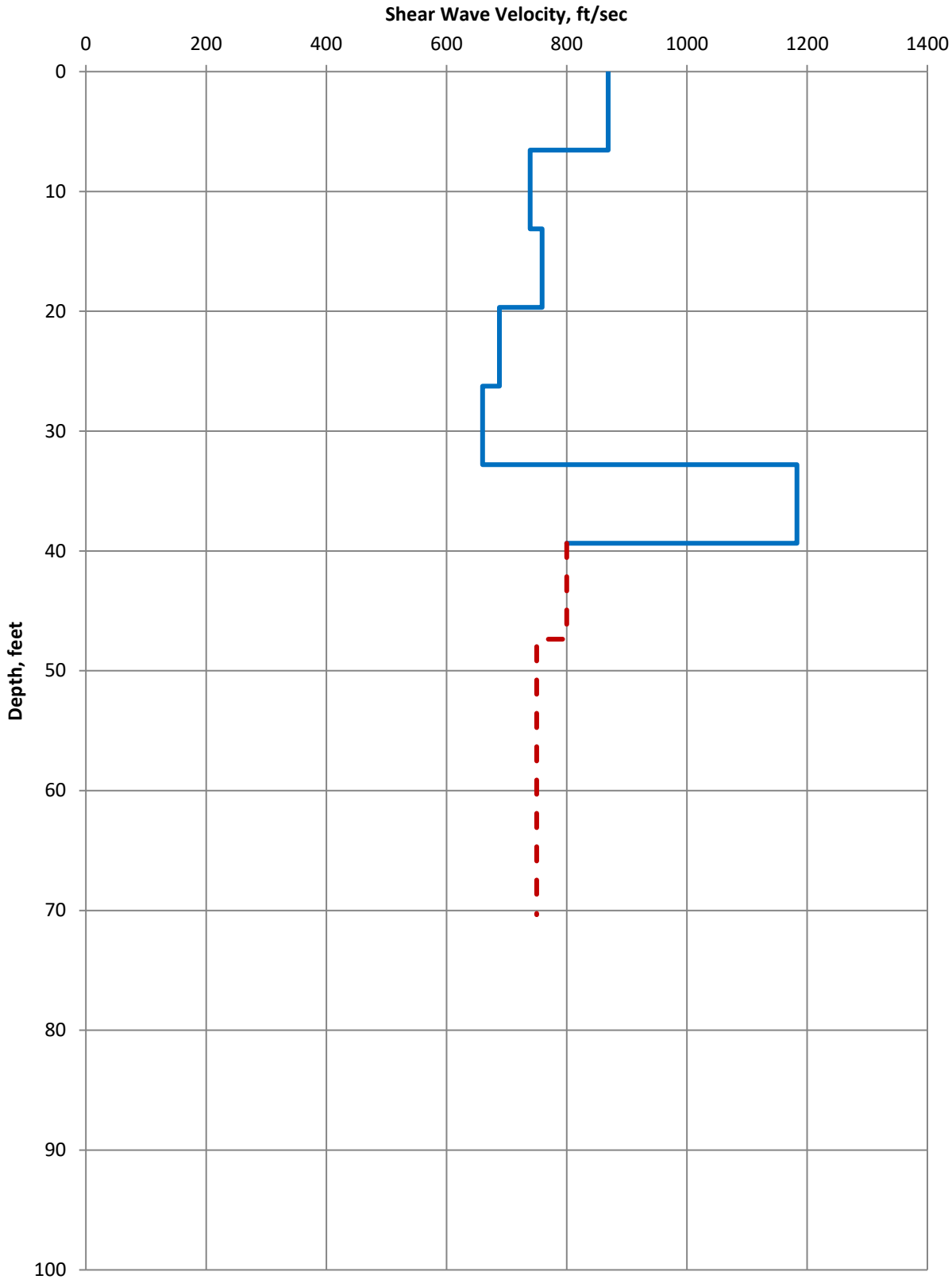


FIGURE A6



PBS

SHEAR WAVE VELOCITY PROFILE

MILLERSBURG, FIRE STATION
MILLERSBURG, OREGON

JUL 2020
17846.000

FIGURE
A7

Appendix B
Laboratory Testing

Appendix B: Laboratory Testing

B1 GENERAL

Samples obtained during the field explorations were examined in the PBS laboratory. The physical characteristics of the samples were noted and field classifications were modified where necessary. During the course of examination, representative samples were selected for further testing. The testing program for the soil samples included standard classification tests, which yield certain index properties of the soils important to an evaluation of soil behavior. The testing procedures are described in the following paragraphs. Unless noted otherwise, all test procedures are in general accordance with applicable ASTM standards. "General accordance" means that certain local and common descriptive practices and methodologies have been followed.

B2 CLASSIFICATION TESTS

B2.1 Visual Classification

The soils were classified in accordance with the Unified Soil Classification System with certain other terminology, such as the relative density or consistency of the soil deposits, in general accordance with engineering practice. In determining the soil type (that is, gravel, sand, silt, or clay) the term that best described the major portion of the sample is used. Modifying terminology to further describe the samples is defined in Table A-1, Terminology Used to Describe Soil, in Appendix A.

B2.2 Moisture (Water) Contents

Natural moisture content determinations were made on samples of the fine-grained soils (that is, silts, clays, and silty sands). The natural moisture content is defined as the ratio of the weight of water to dry weight of soil, expressed as a percentage. The results of the moisture content determinations are presented on the logs of the borings in Appendix A and on Figure B2, Summary of Laboratory Data, in Appendix B.

B2.3 Atterberg Limits

Atterberg limits were determined on select samples for the purpose of classifying soils into various groups for correlation. The results of the Atterberg limits test, which included liquid and plastic limits, are plotted on Figure B1, Atterberg Limits Test Results, and on the explorations logs in Appendix A where applicable.

B2.4 Grain-Size Analyses (P200 Wash)

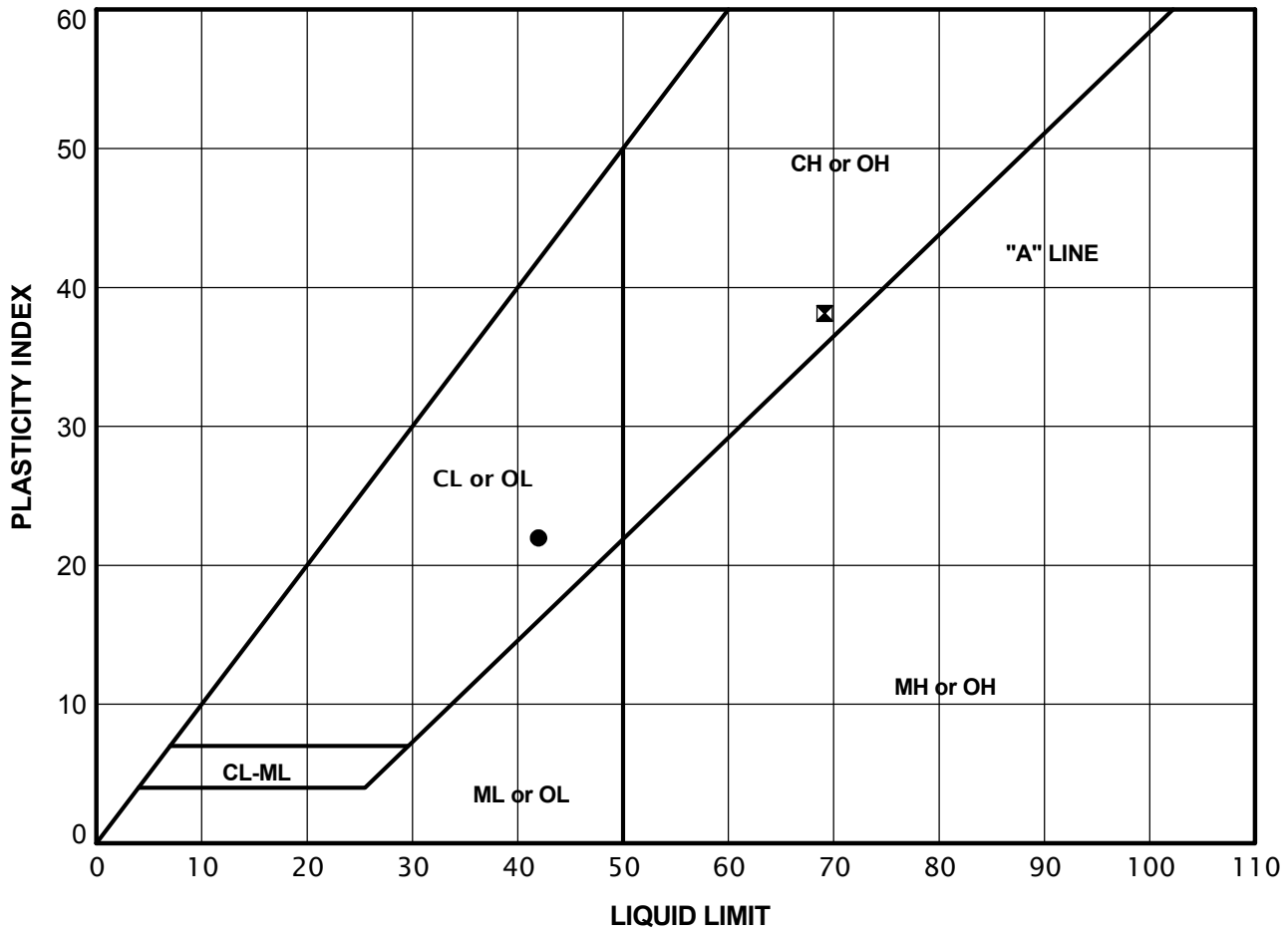
Washed sieve analyses (P200) were completed on samples to determine the portion of soil samples passing the No. 200 Sieve (i.e., silt and clay). The results of the P200 test results are presented on the exploration logs in Appendix A and on Figure B2, Summary of Laboratory Data, in Appendix B.

ATTERBERG LIMITS TEST RESULTS

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

PBS PROJECT NUMBER:
17846.000

TEST METHOD: ASTM D4318



KEY	EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	NATURAL MOISTURE CONTENT (PERCENT)	PERCENT PASSING NO. 40 SIEVE (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	B-3	S-4	10.0	33.7	NA	42	20	22
⊠	B-3	S-7	25.0	47.1	NA	69	31	38

FIGURE B1
Page 1 of 1

SUMMARY OF LABORATORY DATA

MILLERSBURG FIRE STATION
MILLERSBURG, OREGON

PBS PROJECT NUMBER:
17846.000

SAMPLE INFORMATION				MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
B-1	S-1	2.5		31.5							
B-1	S-2	5		33.6				69			
B-2	S-2	5		35.5				88			
B-2	S-4	10		32.4							
B-3	S-3	7.5		33.2				84			
B-3	S-4	10		33.7					42	20	22
B-3	S-5	15		32.4				67			
B-3	S-7	25		47.1					69	31	38
B-3	S-9	35		36.6				54			
B-3	S-11	45		35.8							
B-4	S-1	2.5		27.0							
B-4	S-3	7.5		35.3							

FIGURE B2
Page 1 of 1

Memorandum

DATE	November 25, 2020
TO	City of Millersburg / Albany Fire Department
FROM	Soderstrom Architects 1200 NW Naito Parkway Ste 410 Portland, OR 97209 503-228-5617
PROJECT / NO.	Millersburg Fire Station / Project No. 20006
COPIES TO	Mike Machinski – Corbin, Josh Parker – Corbin, Hans Ettlin – Soderstrom, Dan VanCalcar – Soderstrom
SUBJECT	Tap Out Narrative – Version 1

Based on the discussion that occurred on November 25, 2020 with City of Millersburg staff, Albany Fire Department staff, Complete Wireless Solutions (the Fire Department's radio system vendor), Corbin Consulting Engineers, and Soderstrom Architects, the following is a narrative of how we understand the Tap-Out system to function.

General:

Albany Fire Department currently uses an analog radio-only tone system for calls. However, it is likely that at some point in the future, this will be converted to a digital or IT based system. The proposed tap out system should be designed to accommodate this future change.
Fiber service is being brought to the building as part of the project, and should be designed for connection at the IT closet.

Alert:

Albany Fire Department uses a single alert setting – all functions described below will happen in the same manner for all calls. Upon tone sounding, lighting, audio, select power outlets, and gas valves will be effected. Apparatus Bay doors will be manually triggered. The warning lights at Old Salem Road will be triggered by the Opticom system on the individual fire department vehicles, not by the tap-out system.

Lighting

The following areas should have lights turn on when the tone sounds:

- Apparatus Bay and support spaces
- Hallways:
    - Hallway lighting should be provided with an override switch so it can be manually shut off. After a set time period, it should be returned to tap-out control (i.e. the next call turns them on per the program).
    - In the hallway outside the dorms, theater lighting should be provided in addition to overhead lighting. Theater lighting should be set to be the default lighting between set overnight hours (approximately 10 PM-7 AM), with overhead lighting during the remainder of the day. Both sets of lighting should be controlled by motion sensors and the tap-out system.
- Dorms:
    - Dorm lights should have a gradual increase to full brightness
    - At Station 11, amber or red LED's are used to gradually increase brightness, with the overhead room light illuminating as the final step.
- Meeting Room – lights in this room should be set to turn off or return to prior setting after a designated time period (roughly 60 seconds)

Alert lights are required in the following locations:

- Exercise Room
- Apparatus Support Spaces
- Restrooms

Corbin recommends the use of a lighting control system to control individual lights, and will be providing additional information on how this functions and how it integrates with the tap-out system.

Audio

Speakers are required at all interior locations except: IT, Maintenance, Electrical, Janitor, Shop, Decon, and the Lobby.

- Apparatus Bay: Should be provided with an array of speakers (likely 5 or 6) to ensure alerts are legible throughout the bay.
- Volume Control: Wall-mounted volume control knobs should be located in:
    - Dorms – mount by door
    - Restrooms – mount by door
    - Meeting Room

Speakers are required at the following exterior locations. Exterior speakers should be on a timer such that they are turned off during specified evening/night hours.

- Fire fighters Courtyard
- Truck wash area (north-west building corner)
- Employee Parking (north building wall)

Natural Gas

The gas valve at the kitchen and the gas valve at the courtyard should be triggered to close by the tap out system. They should remain "off" until reset by manual button located in the immediate area.

The gas valves will be "power close" type – their default non-powered state is to be open and allow gas to flow. Upon activation of the tap-out system, power will be sent to the valves to close them, and will be maintained as long as the valves are in the closed condition (until manual reset). The use of standby power/back-up generator will maintain this system in the event of a power failure.

Radio

The radio base station will be located in the IT closet.

Three antenna mounting locations and connections are required: twp omni antennas and one digital antenna. A minimum of 75' is needed between antennas. The Fire Department/CWS will send preferred antenna locations and cutsheets on the antennas.

The Meeting Room should be pre-plumbed for a future HAM Radio antenna connection.

REMARKS