Fruitvale Apartments

1116 Fruitvale Boulevard
Yakima, WA 98133

Project Manual / Bid Set

June 23, 2022
SMR Architects Project #21025.00

YHA
YAKIMA HOUSING AUTHORITY

SMR
ARCHITECTS

OWNER:	Yakima Housing Authority 810 N. 6th Avenue Yakima, WA 98902 (509) 833-4841 Ashleigh Kilgore, Housing Developer; Ashliegh.Kilgore@yakimahousing.org
ARCHITECT:	SMR Architects PLLC 117 South Main Street, Suite 400 Seattle, WA 98104 (206) 623-1104 Scott Starr, Principal; sstarr@smrarchitects.com Tim Quinn, Project Manager, tquinn@smrarchitects.com
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**** These forms must be fully completed, signed by the General Contractor where indicated, and submitted with the executed Contract or Proposal.**

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PREFATORY NOTES

PART 1 GENERAL

1.1 INTRODUCTION

Following information is provided to facilitate Project Manual comprehension, format, language, implications, conventions, and content. This information does not modify the substance of any requirements.

A. Project Manual is divided into Divisions, subdivisions, and Sections for convenience. The titles of these are not intended to imply a particular meaning. Division titles are not intended to fully describe the work of each Division, subdivision, or Section, and are not an integral part of the text specifying requirements.

B. Division and Section Numbers listed in Table of Contents, and items of work included in each Section, conform in general to the Construction Specifications Institute's "Master Format -- Master List of Numbers and Titles for the Construction Industry" from CSI Manual of Practice Documents 2018 Edition. Verify contents page by page to be sure the manual is in complete in accordance with Table of Contents.

C. Except for Division 0 and certain Division 1 sections, sections are usually divided into three "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These parts do not imply particular meaning and are not integral with text requirements.

D. Section parts are numbered independently for each section.

E. Paragraph numbers are self-explanatory and serve to identify text.

F. Project name usually appears at top of each page to assist compilation.

G. Imperative mode text is addressed to (you) Prime Contractor and subcontractor to whom Contract is awarded.

H. Text is most frequently "abbreviated" or "streamlined" type and includes incomplete sentences and phrases where completion must be implied.

I. Trade Associations and General Standard abbreviations:

1. Generally understood abbreviations may be used in text.

2. Refer to Section 01 42 13 for a general listing.

J. Interpret singular words plurally and plural words singularly wherever applicable and full context of requirements implies.

1.2 SPECIAL REQUIREMENTS

A. Wages –the owner and the owner's contractors and subcontractors must pay Davis Bacon - Residential wages to all individuals employed in the construction of the Fruitvale Apartments.

B. The owner, contractors, and subcontractors must also comply with the Contract Work Hours and Safety Standards Act, Department of Labor regulations in 29 CFR part 5, and other applicable federal labor relations laws and regulations, including HUD-Federal Labor Standards Provisions, attached. Also attached, Form WH-347 Payroll, Davis Bacon General Decision for Yakima Co. Residential Wages.

C. Contractor shall require eligible subcontractors to publish rates assumed with their bid and request wage determinations as applicable.

D. Apprenticeship Participation – Contractor and subcontractors shall make best efforts to select builders/contractors that use an approved apprenticeship program as described in the Washington State Governor's Executive Order 00-01. The apprenticeship program requires that a minimum of 15% of total labor hours be provided by Washington State Apprenticeship and Training Council (WSATC)-registered apprentices. The builders/contractors selected should meet the requirements of this Executive Order and should ask those who subcontract this work from them to use apprentice labor. Should such builders/contractors not be available, the Contractor may select the otherwise most responsible and responsive builders/contractors, and should document its efforts to comply with this order. Contractor shall complete the reporting form on a monthly basis. Form Attached 00 72 00.

E. ESDS – All construction under the contract shall meet Evergreen Sustainable Development Standards 4.0 for New Construction as described in the project documents. Compliance with ESDS shall be monitored throughout construction, with release of retainage contingent on documentation that all mandatory and selected optional elements have been satisfied. Evergreen Checklist Attached in section 01 83 15.

F. Section 3 – Contractor and subcontractors must comply with Section 3 of the Housing and Urban Development Act of 1968 for all bids over $100,000. The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low and very low-income persons, particularly persons who are recipients of HUD assistance for housing. See Section 3 Clause attachment. Section 3 Form attached in section 00 73 00. All available positions posted during construction should be reported to the owner to be placed on the YHA website for further reach to low and very low-income persons.

G. WBE/MBE – Contractor and subcontractors will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible, in compliance with 24 CFR part 85.36e.

H. Equal Employment Opportunity Efforts – Contractor shall undertake equal employment opportunity efforts to ensure that applicants and employees are treated, without regard to their sex, race, color, marital status, national origin, religious affiliation, disability, sexual orientation, gender identity or expression or age. The Contractor's equal employment opportunity efforts shall include but not

be limited to, the following; employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeships. See non-discrimination clause attachment 00 75 00.

END OF SECTION

SECTION 00 22 13

INSTRUCTIONS TO BIDDERS - SUPPLEMENT

1.1 SUMMARY

A. Document Includes:
1. Instructions to Bidders.
2. Bid Questions and Substitutions.
3. Site Examination.
4. Additional instructions.

B. Related Documents:
1. Document 00 51 00 – Standard Form of Agreement Between Owner and Contractor (AIA A101 2007).
2. Document 00 65 00 – General Conditions (AIA A201 2007)
3. Section 01 81 13 – Evergreen Sustainable Development Standard.

1.2 INSTRUCTIONS TO BIDDERS

A. AIA document A701-1997, Instructions to Bidders, is binding on the general contractor for this project.

B. Following items supplement, modify, change, and add to referenced Instructions to Bidders, AIA A701-1997. Listed items modify and supplement the Instructions to Bidders document.
1. Article 2 — Bidder's Representations
a. 2.1.5 ADD NEW SUBPARAGRAPH: "The bidder's attention is directed to the fact that all applicable State Laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract as though herein written out in full."
2. Article 3 — Bidding Documents
a. 3.2.1 ADD: "All suppliers and contractor/subcontractors submitting Bids for this Project shall thoroughly familiarize themselves with specified products and installation procedures and submit to Architect any objections (in writing) no later than 10 days prior to Bid Date. Submittal of Bid constitutes acceptance of products and procedures specified as sufficient, adequate, and satisfactory for completion of the Contract."
b. 3.3.1 ADD: "See 01 60 00 Product Requirements."
c. 3.3.4 ADD: "Where the bidder chooses to use an item approved by request but other than the one shown on the details or specified in detail, the bidder shall be responsible for coordination of all necessary changes in other work, and shall bear the cost of such changes."
3. Article 4 — Bidding Procedures
a. 4.2.3 ADD: "The successful bidder's guarantee will be retained by the Owner until bidder has entered into contract with the Owner and furnished performance and payment bonds (if required—see Section 00 61 13); the right is reserved to hold the bid guarantees

of the three next lowest bidders until the successful bidder has done so, or for a period of 60 days, whichever is less time. Bid guarantees of all other bidders will be returned as soon as practicable after opening. Should a bidder fail to enter into contract within ten days of the receipt of notice to proceed, its guarantee will be forfeited to the Contractor as fixed, agreed liquidated damages."

b. 4.4.1 ADD: "No proposal may be withdrawn, except with the Owner's permission, after hour set for Bid opening, unless Contract award is delayed 60 days beyond opening date."

4. Article 5 — Consideration of Bids
   a. 5.3.4 ADD: "The Owner reserves the right to waive irregularities and accept or reject any or all bids."

1.3 BID QUESTIONS AND SUBSTITUTIONS

A. All subcontractor questions to the architect shall be directed through the general contractors.
   1. All questions must be submitted by email. Questions submitted by fax, mail or verbally will not be accepted.
   2. All questions must be submitted by 4:00 p.m. July 8th 2022.
   3. All questions must be submitted electronically to the following email address by the time listed above: Tquinn@smrarchitects.com.

B. All substitution requests shall be directed through the pre-qualified general contractor.
   1. All substitution requests must be submitted by email using the approved form in specification section 01 60 00. Submittals submitted by fax, mail or verbally will not be accepted.
   2. All substitution requests must be submitted by 4:00 p.m. July 8th 2022.
   3. All substitution requests must be submitted electronically to the following email address by the time listed above: Tquinn@smrarchitects.com.

1.4 SPECIAL REQUIREMENTS

A. Please note Special Requirements described in specification section 00 70 10.

1.5 SITE EXAMINATION

A. All bidders must attend a mandatory site walk before submitting a Bid.

B. The site walk will be on Thursday, July 14th At 9:00 a.m. at 1116 Fruitvale Blvd. in Yakima, WA.

C. Contact the Owner with any questions:
   1. Yakima Housing Authority – Ashleigh Kilgore, Project Manager, (509) 833-4841.

1.6 ADDITIONAL INSTRUCTIONS - BID DATE

A. The bid documents will be published on June 24th 2022.

B. A bid addendum will be published on July 20th 2022.

C. All bids are due at 12:00 p.m. on July 27th 2022.

D. All bids must be submitted electronically to the following email address by the time listed above: Ashleigh.Kilgore@yakimahousing.org with “Fruitvale Housing - IFB” as the subject line.

E. Sealed Bids will be received, date and time stamped and remain unopened until opened publicly on July 27th at 1:00 pm. The public bid opening will happen virtually, interested parties will need to request an invitation from Ashleigh.kilgore@yakimahousing.org with “Fruitvale Housing - IFB – bid opening invitation” as subject line.

F. The Yakima Housing Authority reserves the right to cancel this invitation to bid, to waive as informality any irregularities in the bids, to reject any and all bids, and to accept the responsive bid from the lowest, qualified and responsible Contractor whose bid meets all the requirements of this solicitation.

END OF SECTION

SECTION 00 22 15
AVAILABILITY OF BIDDING DOCUMENTS:

Availability of Bidding Documents: Bona fide general contractors (GC's) and subcontractors may obtain the contract documents, including civil, landscape, architectural, structural, mechanical, plumbing, and electrical documents online and at plan rooms as outlined below.

Interested GC's and Sub-Contractors may examine the contract documents by contacting the architect at tquinn@smrarchitects.com or at the following offices and online:

Spokane Regional Plan Center Regional Plan Center | Spokane, WA https://plancenter.net/ 209 N. Havana, Spokane, WA 99202 tel: 509-328-9600 Fax: 509-328-7279	**Tri-City Construction Council** 20 E Kennewick Ave, Kennewick, WA 99336 O (509) 582-7424 http://www.tricityplancenter.com Contact: Miranda Jimerson Email: bidinfo@tcplancenter.com
Abadan Plan Center 603 E Second Ave, Spokane, WA 99202 O (509) 747-2964 F (509) 744-3832 Contact: Plan Room Administrator Email: planroom@abadanplancenter.com	**Seattle Daily Journal of Commerce** Plancenter.com (djc.com) 83 Columbia St., Seattle, WA 98104 O (206) 622-8272 F (206) 622-8416 Contact: Ken Elliott Email: plans@djc.com
SW Washington Contractors Association 7017 NE Highway 99, Suite 214 **Vancouver, WA 98665** (360) 694-7922 Fax: (360) 694-0188 https://www.swca.org/online-plan-center/ contact: Gina Lange Gina@swca.org C: 360.335-7681	**Office of Minority and Women's Business Enterprises See "Bids & Contracting Opportunities"** https://omwbe.wa.gov/small-business-assistance/bids-contracting-opportunities Email: OMWBEWebAdmin@omwbe.wa.gov
CMD Project Portal **http://psp.cmdgroup.com/** 1 800 424 3996	**Daily Journal of Commerce (DJC) - Seattle** **https://www.djc.com/func/plan-index.php**

Other potential plan centers (to be confirmed):

Construct Connect https://www.constructconnect.com/covid-19 contact: Tom Bonaccolto 513-458-8596 Tom.Bonaccolto@constructconnect.com	**The Bluebook Building & Constr. Network** www.thebluebook.com contact: Carissa Salese 800-431-2584 x3179 csalese@mail.thebluebook.com
DODGE Construction Central www.Construction.com contact: April Hamilton 413-304-2008 april.hamilton@construction.com	**Contractor Plan Center** 5468 SE International Way Milwaukie, OR 97222 (503) 650-0148 Fax: (503) 650-8273 http://www.contractorplancenter.com Contact: Brie Kidwell brie@contractorplancenter.com or info@contractorplancenter.com

END OF SECTION

DRAFT

AIA® Document A701™ – 1997

Instructions to Bidders

for the following PROJECT:

«Fruitvale Apartments
1116 Fruitvale Boulevard
Yakima, WA»

THE OWNER:

(Name, legal status and address)

« ««Fruitvale Housing LLLP »« »
«P.O. Box 1447 »
«810 N. 6th Avenue »
«Yakima, WA 98907 »
»« »
« »

THE ARCHITECT:

(Name, legal status and address)

« «SMR Architects PLLC »
«117 South Main Street, Suite 400 »
«Seattle, WA 98104 »
« »

for the following Project:

»«YHA Fruitvale
1116 Fruitvale Blvd.
Yakima, WA 98902 »
« »

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8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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

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

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

§ 2.1.5 The bidder’s attention is directed to the fact that all applicable State Laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract as though herein written out in full.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the

deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered. All suppliers and contractor/subcontractors submitting Bids for this Project shall thoroughly familiarize themselves with specified products and installation procedures and submit to Architect any objections (in writing) no later than 10 days prior to Bid Date. Submittal of Bid constitutes acceptance of products and procedures specified as sufficient, adequate, and satisfactory for completion of the Contract.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 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. See 01 60 00 Product Requirements.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents. Where the bidder chooses to use an item approved by request but other than the one shown on the details or specified in detail, the bidder shall be responsible for coordination of all necessary changes in other work, and shall bear the cost of such changes.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected. The successful bidder's guarantee will be retained by the Owner until bidder has entered into contract with the Owner and furnished performance and payment bonds; the right is reserved to hold the bid guarantees of the three next lowest bidders until the successful bidder has done so, or for a period of 60 days, whichever is less time. Bid guarantees of all other bidders will be returned as soon as practicable after opening. Should a bidder fail to enter into contract within ten days of the receipt of notice to proceed, its guarantee will be forfeited to the Contractor as fixed, agreed liquidated damages.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid. No proposal may be withdrawn, except with the Owner's permission, after hour set for Bid opening, unless Contract award is delayed 60 days beyond opening date.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

§ 5.3.4 The Owner reserves the right to waive irregularities and accept or reject any or all bids.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

SECTION 00 31 00

CONSTRUCTION COST FORM

TO: FRUITVALE HOUSING LLLP
810 N. 6th Avenue
Yakima, WA 98902

FROM: _____ BIDDER

_____ ADDRESS

_____ CITY / STATE / ZIP

The Undersigned hereby certifies that he/she has carefully examined the Project Manual and Drawings for the construction of the Fruitvale Apartment project located at 1116 Fruitvale Blvd. in Yakima, Washington and that he/she has examined the site of the work and the location where said work is to be done, and fully understands the manner in which payment is proposed to be made for the cost thereof, hereby proposes to furnish all materials and to perform all labor which may be required to complete said work within the time fixed, and upon the terms and conditions provided in the said Project Manual and Drawings at the following prices:

A. BASE COST

For all work shown on the drawings and in the Project Manual (DIVISION 0-33), the sum of:

BID PRICE: _____

_____ Dollars ($_____)

SALES TAX: _____

_____ Dollars ($_____)

TOTAL PRICE: _____

_____ Dollars ($_____)

Note: “TOTAL PRICE” is Bid Price plus sales tax.

B. UNIT PRICES

Include full compensation for required labor, products, tools, equipment, transportation, services and incidentals, erection, application or installation of item of the work; overhead and profit; sales tax.

UNIT PRICEs Price

Unit price No. 1: Contaminated Soil **$_____**
Price for removal and proper disposal of 10 cubic yards of contaminated soil.

C. ADDITIVE/DEDUCTIVE COSTS

Include full compensation for required labor, products, tools, equipment, transportation, services and incidentals, erection, application or installation of item of the work; overhead and profit; sales tax.

Undersigned agrees to perform the construction work associated with the alternates described in the Contract Documents in Section 01 20 00 — 1.7 for the following additions to or deductions from the Base Cost, if any.

Owner may accept all, part, or none of listed Additive/Deductive Costs.

ADDITIVE/DEDUCTIVE COST NUMBER Addition Deduction

Alternate Bid No. 1: Plastic Laminate Countertops **$_____**
Base bid: Solid surface countertops in all kitchens and bathrooms per 06 61 16.
Deductive Alternate: Replace solid surface countertops with Plastic Laminate Countertops per 06 61 00.

Alternate Bid No. 2: Fruitvale Avenue Fence **$_____**
Base bid: chain link fence on Fruitvale Avenue as shown in drawings and per 32 31 16.
Deductive Alternate: Delete fence on Fruitvale Avenue.

Alternate Bid No. 3: Motorized Gates on Fruitvale Ave. **$_____**
Base bid: motorized traffic gates on Fruitvale Avenue as shown in drawings and per 32 31 16.
Deductive Alternate: Delete motorized gate, access control for gate and power for motorized gates.

Alternate Bid No. 4: Off Site parking. **$_____**
Base bid: pave, stripe and number southeast parking lot as shown on drawings.
Deductive Alternate: Delete paving, striping and number of southeast parking lot.

Alternate Bid No. 5: Bullet resistant glass. **$_____**
Base bid: Bullet resistant glass in windows and relites as shown in drawings and per 08 80 00.
Deductive Alternate: Replace bullet resistant glass with tempered safety glass.

Alternate Bid No. 6: Mirror Glass. **$_____**
Base bid: Tinted glass in windows as shown in drawings and per 08 80 00.
Deductive Alternate Replace tinted glass with transparent tempered safety glass.

Alternate Bid No. 7: Appliance purchase. **$_____**
Base bid: appliances purchased by contractor per spec section 11 31 00.

Deductive Alternate: Unit and common room refrigerators, ranges and range hoods purchased by owner.

Alternate Bid No. 8: Appliance install. **$_____**
Base bid: appliances installed by contractor per spec section 11 31 00.
Deductive Alternate: Unit and common room refrigerators and ranges installed by owner. Note range hoods installed by contractor.

Alternate Bid No. 9: Commissioning. **$_____**
Base bid: commissioning per WSEC by contractor.
Deductive Alternate: commissioning by third party commissioning agent hired by owner.

Total Deductions: **$_____**

D. OVERHEAD, PROFIT, AND THE LIKE

All proposals listed in this Cost Form (including Base Costs and Alternate Costs) include overhead, profit, and all other expenses involved.

E. STATE SALES TAX

The Undersigned agrees that the above-named Base Costs and Alternate Costs include Washington State or local sales tax.

F. TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Undersigned agrees, if awarded the contract, to fully complete the Work within the Contract Time following authorization to proceed. The Undersigned further agrees that for each calendar day after the time established for completion of the Work, and where the Work is not fully performed, that he/she may be assessed liquidated damages representing the Owner's actual damages incurred, but not as a penalty.

G. CONTRACT AND PERFORMANCE BOND

If written notice of the acceptance of this Cost Proposal is mailed, telegraphed or delivered to the Undersigned within sixty (60) days after the date of opening of Bids, or any time thereafter before the Costs are withdrawn, the Undersigned agrees that he/she will execute and deliver a contract in the form attached hereto as required by the Contract Documents, in accordance with the Costs as accepted and that he/she will furnish Performance Bonds and Payment Bonds as specified, with good and sufficient surety or sureties, all within ten (10) days after the prescribed forms are presented to him/her for signature.

H. ADDITIONAL DOCUMENTS

The Undersigned has included the following forms with the Bid:

1. Apprenticeship participation form per specification section 00 70 40.
2. Section 3 form per specification section 00 73 10.
3. Federal Eligibility Certification (Debarment Form) per specification section 00 74 00.

4. Non-Collusion Affidavit per specification section 00 74 20.
5. Equal Employment Opportunity Certification per specification section 00 75 05.

I. ADDENDA RECEIVED

The Undersigned acknowledges receipt of the following Addenda:

Addendum No. _____ Date _____

J. WAGE RATES

The Undersigned agrees that the bid price is based on the wage rates specified in section 00 71 20.

K. ESDS EXPERIENCE

The Undersigned certifies that they or their firm has completed at least five projects that were required to meet Washington State's Evergreen Sustainable Development Standards.

L. SPECIAL CONDITIONS

The Undersigned certifies that they acknowledge the special conditions shown in specification section 00 70 10.

M. FIRM IDNETIFICATION

Legal Name of Firm:_____

If Firm is a Corporation, State of Incorporation: _____

If Firm is a partnership, state names of partners:_____

_____

_____

If Firm is an individual using a trade name, state name of individual: _____

_____

Contractor Registration Number: _____

Contractor License Number: _____

N. SIGNITURE

Signature of person or persons legally authorized to bind Bidder to a Contract.

Name:_____

By (Signature): _____

Title: _____

Address: _____

City/State/Zip: _____

Telephone: _____

Email Address: _____

Date: _____

END OF BID FORM

SECTION 00 41 00

INFORMATIONAL DOCUMENTS MEMO

PART 1 GENERAL

1.1 INTRODUCTION

A. These documents are bound into these bidding documents as a convenience to the Owner and Contractor(s). The Architect did not prepare these materials, and the Architect shall not be responsible for the content there of, nor for the work done there under.

1.2 SOILS REPORT

A. A Soils Report has been completed for the site by the owner. The report is by PLSA and is dated April 7, 2022. The summary of the report is included as section 00 45 00.

1.3 ENVIRONMENTAL REPORTS

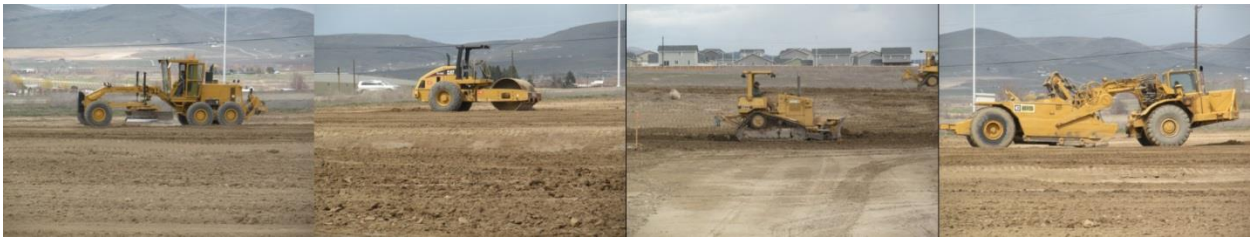
A. Environmental Reports have been completed for the site by the owner. The reports are by Fulcrum Environmental Consulting, 406 North 2nd Street, Yakima WA 98901. Digital copies of all reports can be provided by the owner as requested. Contact Tim Quinn at tquinn@smrarchitects.com for the reports.

B. Reports include:
1. Revised Phase I Environmental Report dated February 6, 2020. Project number 192913.00
2. Phase II Environmental Report dated February 28, 2020. Project number 192913.01.
3. Soil Remediation Work Plan Fruitvale (Joes Grinding) Cleanup dated April 20, 2022. Project number 223450.00.
4. Sampling and Analysis Plan/Quality Assurance Project Plan Fruitvale (Joes Grinding) Cleanup dated April 20, 2022. Project number 223450.00
5. Asbestos Containing Materials Inspection Report for the Residence and Shed at 1122 Fruitvale Boulevard dated January 31, 2020. Project #192913.02,
6. Asbestos Containing Materials Inspection Report for Joe's Grinding 1114 Fruitvale Boulevard dated January 31, 2020. Project #192913.02,

END OF SECTION

PLSA

Engineering & Surveying



REPORT ON GEOTECHNICAL OBSERVATIONS

Yakima Housing Authority – Fruitvale Housing Development
Fruitvale Boulevard
Yakima, Washington 98902

Yakima County Tax Parcel(s): 181313-21516

April 7, 2022
PLSA Project No. 20039

Prepared for:

Yakima Housing Authority
P.O. Box 1447
Yakima, WA 98907

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1 INTRODUCTION

Yakima Housing Authority retained PLSA Engineering and Surveying to perform a geotechnical investigation on a 0.88-acre site, located on the south side of Fruitvale Boulevard approximately half a block west of the intersection of 6th Avenue, Yakima Washington. The parcels can be identified by the auditor's tax parcel numbers previously listed. See Appendix "A" for vicinity map.

This report summarizes the results of our geotechnical investigation and offers our recommendations for soil bearing values and site preparation for a proposed multi-family housing project including paved parking and utilities. The investigation consisted of visual inspection of the area, drawing upon extensive local knowledge of nearby soil conditions, and examination and logging of 5 test pits excavated using a John Deere 410L tractor mounted backhoe. See Appendix "B" Test Pit Location Map. A geotechnical engineer from PLSA, experienced with local soil conditions, logged the excavations and observed and field classified the soils found.

Included in this report are the following:

- Seismic zone information.
- Liquefaction Potential.
- Excavation logs and field classifications of the soils encountered in the 6 test pits.
- Estimated frost penetration.
- Structural fill recommendations.
- Recommended minimum footing depth and width.
- Recommended footing trench preparation.
- Soil bearing recommendations.
- Lateral Earth Pressure
- Stormwater Recommendations
- Slab on grade support recommendations.
- Parking lot site preparation and paving recommendations.

2 LAND USE AND SURFACE CONDITIONS

Prior to recent parcel mergers the site consisted of 5 residential lots. The original five lots have been combined into one parcel. The residences have been demolished and removed from the site with the except of a small quantity of concrete debris. The current vacant parcel is flat with exposed bare soil on the surface. Shallow foundations and crawl spaces have been backfilled. Additional site work recommendations are described below, to address shallow undocumented fill on the site. Electric, water, sewer, natural gas, and telephone utilities are available.

3 SITE PREPARATION

The remaining demolition debris should be removed from the site. Prior to placing structural, as described below, the site is recommended to be proof rolled using a fully loaded tandem axle truck

to identify soft areas. The proof rolling should be observed by a geotechnical engineer. Any soft or unsuitable material should be removed and replaced with structural fill.

4 SEISMIC CONSIDERATIONS

Based on Table 20.3-1 found in ASCE-7, Chapter 20, and the gravel soil observed during the field investigation, the site is classified as Soil Class C. This classification is also in general agreement with the Washington Geologic Information Portal maintained by the Washington State Department of Natural Resources. Site specific design values, using Class C designation, are provided below in Table 1.

Table 1: USGS Seismic Design Parameters

	0.2 Second	**1.0 Second**
Maximum Considered Earthquake (MCE) Spectral Acceleration	S_s=0.473	S_1=0.197
Site Coefficient	F_a=1.3	F_v=1.5
MCE Adjusted for Site Class effects	S_{MS}=0.615	S_{M1}=0.296
Design Spectral Acceleration	S_{DS}=0.41	S_{D1}=0.197

5 LIQUEFACTION POTENTIAL

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure, in loose soils, that reduces the effective stress between soil particles to near zero. This rapid increase in pore water pressure can cause a loss of soil shear strength. The Washington State Department of Natural Resource's Geologic Information Portal reports the susceptibility of this location to be low to very low. This is consistent with observation of an underlying deep stratum of free draining sand and gravel.

6 SUB-SURFACE CONDITIONS

Observations in all 5 test pits were similar consisting of a surface stratum of silt and fine sand followed by a deep, alluvially deposited, stratum of gravel, and sand. See test pit soil logs found in Appendix "C". Current observations are consistent with numerous investigations within the area. The USDA Soil Conservation Service classifies the topsoil as "Ashue Loam" with a soil profile consistent with field observations. See Appendix "D" for USDA Soil Report.

According to the Washington Industrial Safety and Health Act (WISHA) regulations the soil described above has a Class "C" designation and can be benched at 1.5H:1.0V. Long term finish grade slopes are recommended to be no steeper than 2.0H:1.0V.

Free groundwater was not encountered. Experience with other, nearby excavations has shown groundwater to be 14 feet below the surface during the irrigation season and variable down to 20 feet during winter when irrigation is not available.

Frost action is usually severe in the area due to the water holding capacity of the silt soil. Frost action is minimal in the underlying gravel soil. Frost penetration for the project location is estimated at 30 inches. Frost damage may be minimized by placing footings a minimum of 30 inches below finished grade and by directing drainage away from the buildings.

7 SOIL BEARING RECOMMENDATIONS

PLSA understands that development of the property includes a four-story wood frame multi-family housing facility with concrete slab-on-grade floors. The development also includes asphalt parking lots, sidewalks, and underground utilities.

A minimum footing depth of 30 inches below lowest adjacent finished grade is recommended, for frost protection and mobilization of bearing capacity. The recommended minimum footing width is three feet.

Recommended footing trench preparation is as follows: Excavated footing trenches two feet wider than the footing, through the topsoil to the gravels below. Proof-roll the exposed trench bottom to firm and unyielding. Footings may bear on native, firm, and unyielding sand and gravel. If over excavation is required, proof roll the exposed trench bottom to firm and unyielding and place compacted, cohesionless, free-draining, gravel, such as 1-¼ inch minus crushed surfacing base course, up to desired footing grade. Compact the crushed rock in lifts to 95 percent of maximum density as determined by ASTM D-1557 to produce a firm, stable, and unyielding surface. Using a minimum footing width and the footing trench preparation recommended above, satisfactory soil support for loadings up to 4,200 pounds per square foot (psf) should be achieved. If a greater soil bearing value is required contact this office for additional recommendations.

Slabs on grade may be placed over silt surface soil. Remove all vegetation and other organic material from areas planned to support slabs. Compact the exposed surface, for depth of 12 inches, to 95 percent of maximum density as determined by ASTM D-1557. If optimum moisture content for compaction is exceeded, dry the soil by excavation, aeration, or replacement. Place a 6 inch minimum thickness layer consisting of compact, granular, free-draining material such as 5/8 inch minus crushed rock meeting APWA standard specifications for top course. Compact the granular material in a minimum of two layers to 95 percent of maximum density as determined by ASTM D-1557. Using this preparation, a subgrade reaction value, Ks, of 250 should be achieved.

All roof and surface drainage are recommended to be directed away from the footings and exterior slabs. Buildings should be elevated or placed on structural fill as necessary to provide slope to insure adequate drainage.

8 LATERAL EARTH PRESSURE

Magnitude of lateral earth pressure varies with the height of the supported face, soil internal friction, backfill soil density, presence or absence of water, and amount of surcharge, if any. PLSA recommends selecting 135 pounds per cubic foot (pcf) as an appropriate unit weight of compacted native sand and gravel backfill. Use of other soil types for backfill will require using a unit weight

appropriate for the type of soil selected. Coefficients of lateral pressure and unsaturated equivalent fluid weight for the native sand & gravel are as follows:

			Equivalent Fluid Wt. (pcf)
			Sand & Gravel
Active	K_a	0.29	40
At Rest	K_o	0.52	61
Passive	K_p	3.39	458

9 STRUCTURAL FILL

All areas to receive structural fill are recommended to be stripped of all paving, vegetation, organic material, and trash. Proof rolled the exposed surface to 95 percent of maximum density as determined by ASTM D-1557 for a depth of 6 inches before placing fill. The soil should be near optimum moisture content for compaction. Add water or dry the soil by processing as necessary to achieve moisture content suitable for compaction. If the fill subgrade soils are persistently too wet to achieve specified compaction, contact this office for additional fill subgrade preparation recommendations.

Imported soil used for structural fill is recommended to be cohesionless, free draining, non-plastic material with a maximum particle size of two inches, or other material as approved by a geotechnical engineer from this office.

All structural fill should be placed and compacted in layers not exceeding 6 inches in thickness. Water should be added as needed to achieve satisfactory moisture content for compaction. Soils too wet to be adequately compacted should be dried to a suitable moisture content before incorporation into structural fill. Recommended compaction for structural fill is 95 percent of maximum density as determined by ASTM D-1557. It is further recommended that all soil compaction as recommended herein be monitored using a nuclear density gauge and documented.

Structural fill should not be placed over debris which may be poorly consolidated or contain organic material or metal that may decompose and settle with time. All such unsuitable materials should be removed and replaced with additional structural fill as described above.

Excavations resulting from removal of underground structures such as septic tanks, or petroleum tanks are recommended to be backfilled using procedures described for structural fill.

Structural fill placed as described above is expected to provide bearing support equivalent to that for recommended preparation of footing trenches in the native soil supporting the fill. Soil bearing support for slabs on grade on structural fill placed as recommended herein is also expected to be equivalent to that recommended for the native soil prepared as recommended herein.

Utility trench backfill is recommended to consist of a 6-inch-thick bedding material of 5/8 minus crushed surfacing top course, compacted to firm and unyielding. Bedding material is recommended above, below, and on both sides of the utility. Structural fill as described above may

be placed in lifts above the bedded utility. The upper 4 feet of trench shall be compacted to 95% as determined by ASTM D1557. See civil plans for municipal water and sewer main requirements.

10 STORMWATER DISPOSAL (SOIL INFILTRATION RATES)

The topsoil observed in the upper 12 to 24 inches contains a fine sand and significant silt component. The USDA Web Soil Survey reports that these soils are classified in the Hydrologic Soils Group C with a moderate rate of infiltration. The cation-exchange capacity (CEC), for the site topsoil, is 19.1 milliequivalents per 100 grams of dry soil, exceeding the minimum requirement of 5 milliequivalents. See analytical results for sample TP-5-18 in Appendix D. Based on experience with these soils, a long-term infiltration rate of 0.50 inches per hour can be expected for the native undisturbed silty sand. All construction traffic is recommended to be prohibited in areas that are proposed to be used for stormwater infiltration. Even minimal incidental compaction can reduce infiltration performance.

The underlying sand and gravel are free draining. Gradation analysis and previous in-situ infiltrations test at nearby sites predicts infiltration rates more than 36" per hour. Based on experience with this same gravel soil stratum a long-term design infiltration rate of 12 inches per hour is recommended. The cation-exchange capacity (CEC), for the site topsoil, is 10.7 milliequivalents per 100 grams of dry soil base on test perform for a nearby investigation within the same soil regime.

All roof and surface drainage are recommended to be directed away from the footings. Buildings should be elevated or placed on structural fill as necessary to provide slope to insure adequate drainage.

11 PAVING RECOMMENDATIONS

All areas to be paved should be cleared of all grass, roots, trash, metal and organic materials down to full depth below the paving mat. The exposed soil surface should then be compacted to an 8-inch depth, to 90 percent of the maximum theoretical density as determined by ASTM D-1557, using a mechanical vibratory compactor.

The following specification is our recommendation for paving and subgrade: Asphaltic Concrete Paving, mix design and placement, shall conform to Washington State Department of Transportation (WSDOT) Standard Specifications 2016, Division 5, Class HMA ½. Areas subject to regular truck traffic shall be a minimum of 3 inches, compacted thickness, of asphaltic concrete placed over a minimum of 9 inches of free-draining, crushed surfacing conforming to the particle size distribution for Base Coarse found in section 9-03.9(3) of the WSDOT Standard Specifications. Base Coarse gravel shall be compacted in lifts to 90 percent of the maximum theoretical density as determined by ASTM D-1557, using a mechanical vibratory compactor.

Asphaltic concrete paving placed on parking lot areas used exclusively by automobiles may be reduced to 2 inches compacted thickness.

SECTION 00 51 00

AGREEMENT PREAMBLE

1.1 GENERAL

A. The Standard Form of Agreement Between Owner and Contractor, AIA Document A 101, 2007 Edition, is included as part of the Contract. Note the document has been edited by YHA. The Contractor shall be required to execute this document at the time a contract for construction is executed.

END OF SECTION

SECTION 00 61 13

PERFORMANCE & PAYMENT BOND PREAMBLE

1.1 GENERAL

A. The Performance Bond, AIA Document A 312, 2010 Edition, is included as part of the Contract.
   1. A performance bond on the part of the contractor for 100% of the contract price. A “performance bond” is one executed in connection with a contract to secure fulfillment of all the contractor’s obligations under such contract.

B. The Payment Bond, AIA Document A 312, 2010 Edition, is included as part of the Contract.
   1. A payment bond on the part of the contractor for 100% of the contract price. A “payment bond” is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

C. The Contractor shall be required to execute these documents at the time a contract for construction is executed.

END OF SECTION

DRAFT

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

« »
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

SECTION 00 65 00

GENERAL CONDITIONS PREAMBLE

1.1 GENERAL

A. The General Conditions of the Contract for Construction, AIA Document A 201, 2017 Edition, is included as part of the Contract. Note this document has been edited by YHA. The Contractor shall be required to execute this document at the time a contract for construction is executed.

END OF SECTION

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

YHA Fruitvale
1112-1122 Fruitvale BLVD
Yakima, WA 98902»
«»

THE OWNER:
(Name, legal status and address)

««Fruitvale Housing LLLP »
«P.O. Box 1447 »
«810 N. 6th Avenue »
«Yakima, WA 98907 »
20»
»« »
« »

THE ARCHITECT:
(Name, legal status and address)

«SMR Architects PLLC »
«117 South Main Street, Suite 400 »
«Seattle, WA 98104 »
« »

for the following Project:
«
YHA Fruitvale
1116 Fruitvale BLVD
Yakima, WA 98902»
»« »
« »

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7 CHANGES IN THE WORK

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or

relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and

similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in

number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

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

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

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

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

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

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- **.1** employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract

Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work

properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party

provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 00 70 10

SPECIAL REQUIREMENTS

1.1 SUMMARY

A. Document Includes:
1. Wage Rates.
2. Labor Standards.
3. Apprenticeship.
4. ESDS Requirements.
5. Section 3.
6. Women and Minority Owned Businesses.
7. Federal Eligibility
8. Equal Employment Opportunity

B. Related Documents:
1. Document 00 51 00 – Standard Form of Agreement Between Owner and Contractor (AIA A101 2007).
2. Document 00 65 00 – General Conditions (AIA A201 2007)

1.2 WAGE RATES

A. The General Contractor and all subcontractors shall pay the following wage rates:
1. Davis Bacon Residential Wage rates for Yakima County current as of June 23, 2022.
2. See wage rates attached as specification section 00 71 20.

B. See Form WH-347 Payroll, Davis Bacon General Decision for Yakima Co. Residential Wages (WAGE RATES) attached as specification section 00 71 00

C. Contractor shall require eligible subcontractors to publish rates assumed with their bid and request wage determinations as applicable.

1.3 LABOR STANDARDS

A. The owner, contractors, and subcontractors must also comply with the Contract Work Hours and Safety Standards Act, Department of Labor regulations in 29 CFR part 5, and other applicable federal labor relations laws and regulations, including HUD-Federal Labor Standards Provisions, attached as specification section 00 71 30.

1.4 APPRENTICESHIP PARTICIPATION

A. Apprenticeship Participation – Contractor and subcontractors shall make best efforts to select builders/contractors that use an approved apprenticeship program as described in the Washington State Governor’s Executive Order 00-01.

B. The apprenticeship program requires that a minimum of 15% of total labor hours be provided by Washington State Apprenticeship and Training Council (WSATC)-

registered apprentices. The builders/contractors selected should meet the requirements of this Executive Order and should ask those who subcontract this work from them to use apprentice labor. Should such builders/contractors not be available, the Contractor may select the otherwise most responsible and responsive builders/contractors, and should document its efforts to comply with this order. Contractor shall complete the reporting form on a monthly basis.

C. See Apprenticeship Participation Form Attached as specification section 00 72 00.

1.5 ESDS PARTICIPATION

A. All construction under the contract shall meet Evergreen Sustainable Development Standards 4.0 for New Construction as described in the project documents. Compliance with ESDS shall be monitored throughout construction. Evergreen Plan Attached as specification section 01 81 15.

1.6 SECTION 3

A. Contractor and subcontractors must comply with Section 3 of the Housing and Urban Development Act of 1968 for all bids over $100,000. The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. See Section 3 Clause attached as specification section 00 73 00.

C. See Section 3 Form attached as specification section 00 73 10.

1.7 WOMEN AND MINORITY OWNED BUISNESSES

A. WBE/MBE – Contractor and subcontractors will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible, in compliance with 24 CFR part 85.36e.

1.8 FEDERAL ELIGIBILITY

A. Contractor certifies neither they nor their subcontractors are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal department or agency.

B. Eligibility Certification (Debarment Form) Attached as specification section 00 74 00.

1.9 EQUAL EMPLOYEMENT OPPORTUNITY

A. Equal Employment Opportunity Efforts – Contractor shall undertake equal employment opportunity efforts to ensure that applicants and employees are

treated, without regard to their sex, race, color, marital status, national origin, religious affiliation, disability, sexual orientation, gender identity or expression or age. The Contractor's equal employment opportunity efforts shall include but not be limited to, the following; employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeships.

B. See non-discrimination clause attached as specification section 00 75 00.

C. See EEO Poster attached as specification section 00 75 10.

END OF SECTION

U.S. Department of Labor
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

U.S. Wage and Hour Division

Rev. Dec. 2008

OMB No.:1235-0008
Expires: 04/30/2021

NAME OF CONTRACTOR ☐ OR SUBCONTRACTOR ☐	ADDRESS	
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION / PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE — HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS: FICA	WITH-HOLDING TAX			OTHER	TOTAL DEDUCTIONS	(9) NET WAGES PAID FOR WEEK
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

Department of Labor and Industries
Prevailing Wage
(360) 902-5335
www.lni.wa.gov/TradesLicensing/PrevWage

STATEMENT OF INTENT TO PAY PREVAILING WAGES

Public Works Contract
$40.00 Filing Fee Required

- This form **must** be typed or printed in ink.
- **Fill in all blanks or the form will be returned for correction (see instructions).**
- Please allow a **minimum** of 10 working days for processing.
- Once approved, your form will be posted online at https://fortress.wa.gov/lni/pwiapub/SearchFor.asp

Intent ID # (Assigned by L&I)_____

Your Company Information		
Your Company Name		
Your Address		
City	State	Zip+4
Your Contractor Registration Number	Your UBI Number	
Your Industrial Insurance Account Number		
Your Email Address (required for notification of approval)	Your Phone Number	

Awarding Agency Information		
Project Name Fruitvale Apartmentsr	Contract Number	
Awarding Agency Yakima Housing Authority		
Awarding Agency Address 810 North 6th Avenue		
City Yakima	State WA	Zip+4 98902
Awarding Agency Contact Name Ashliegh Kilgore	Phone Number	
County Where Work Will Be Performed Yakima County, WA	City Where Work Will Be Performed Yakima, WA	

Additional Details	
Your Expected Job Start Date (mm/dd/yyyy)	
Job Site Address/Directions 1116 Fruitvale Blvd. , Yakima, WA 98902	

Contract Details		
Bid Due Date (**Prime Contractor's**)	Award Date (**Prime Contractor's**)	
Total Dollar Amount of **Your** Contract (including sales tax) or indicate time and materials, if applicable.	$	☐ T&M

ARRA Funds	**Weatherization or Energy Efficient Funds**
Does this project utilize American Recovery and Reinvestment Act (ARRA) funds? ☐ Yes ☐ No	Does this project utilize any weatherization or energy efficiency upgrade funds (ARRA or otherwise)? ☐ Yes ☒ No

Prime Contractor's Company Information		**Hiring Contractor's Company Information**	
Prime Contractor's Company Name	Prime Contractor's Intent Number	Hiring Contractor's Company Name	
Prime Contractor's Registration Number	Prime Contractor's UBI Number	Hiring Company's Contractor Registration Number	Hiring Contractors UBI Number

Employment Information

Do you intend to use **ANY** subcontractors?	☒ Yes	☐ No	Will employees perform work on this project?	☐ Yes	☐ No
Will **ALL** work be subcontracted?	☐ Yes	☐ No	Do you intend to use apprentice employees?	☐ Yes	☐ No

Number of Owner/Operators who own at least 30% of the company who will perform work on this project: ☐ None (0) ☐ One (1) ☐ Two (2) ☐ Three (3)

Crafts/Trades/Occupations – (Do not list apprentices. They are listed on the Affidavit of Wages Paid only.) If an employee works in more than one trade, ensure that all hours worked in each trade are reported below. For additional crafts/trades/occupations please use Addendum A.	**Number of Workers**	**Rate of Hourly Pay**	**Rate of Hourly Usual ("Fringe") Benefits**

Signature Block

I hereby certify that I have read and understand the instructions to complete this form and that the information, including any addenda, are correct and that all workers I employ on this Public Works Project will be paid no less than the Prevailing Wage Rate(s) as determined by the Industrial Statistician of the Department of Labor and Industries.

Print Name: **Print Title:** **Signature:** **Date:**

For L&I Use Only

Approved by signature of the Department of Labor and Industries Industrial Statistician

NOTICE: If the prime contract is at a cost of over one million dollars ($1,000,000.00), RCW 39.04.370 requires you to complete the EHB 2805 (RCW 39.04.370) Addendum and attach it to your Affidavit of Wages of Paid when your work on the project concludes. This is only a notice. The EHB 2805 Addendum is not submitted with this Intent.

Department of Labor and Industries
Prevailing Wage
(360) 902-5335
www.lni.wa.gov/TradesLicensing/PrevWage

STATEMENT OF INTENT TO PAY PREVAILING WAGES

Public Works Contract
$40.00 Filing Fee Required

- This form must be typed or printed in ink.
- **Fill in all blanks or the form will be returned for correction (see instructions).**
- Please allow a **minimum** of 10 working days for processing.
- Once approved, your form will be posted online at https://fortress.wa.gov/lni/pwiapub/SearchFor.asp

Intent ID # (Assigned by L&I)_____

Your Company Information 1			**Awarding Agency Information** 2		
Your Company Name			Project Name		Contract Number
Your Address			Awarding Agency		
City	State	Zip+4	Awarding Agency Address		
Your Contractor Registration Number	Your UBI Number		City	State	Zip+4
Your Industrial Insurance Account Number			Awarding Agency Contact Name	Phone Number	
Your Email Address (required for notification of approval)	Your Phone Number		County Where Work Will Be Performed	City Where Work Will Be Performed	
Additional Details 3			**Contract Details** 4		
Your Expected Job Start Date (mm/dd/yyyy)			Bid Due Date (**Prime Contractor's**)	Award Date (**Prime Contractor's**)	
Job Site Address/Directions			Total Dollar Amount of **Your** Contract (including sales tax) or indicate time and materials, if applicable.	$	☐ T&M
ARRA Funds 5			**Weatherization or Energy Efficient Funds**		
Does this project utilize American Recovery and Reinvestment Act (ARRA) funds? ☐ Yes ☐ No			Does this project utilize any weatherization or energy efficiency upgrade funds (ARRA or otherwise)? ☐ Yes ☐ No		
Prime Contractor's Company Info 6			**Hiring Contractor's Company tion** 7		
Prime Contractor's Company Name	Prime Contractor's Intent Number		Hiring Contractor's Company Name		
Prime Contractor's Registration Number	Prime Contractor's UBI Number		Hiring Contractor's Contractor Registration Number	Hiring Contractor's UBI Number	

Employment Information 8					
Do you intend to use **ANY** subcontractors?	☐ Yes	☐ No	Will employees perform work on this project?	☐ Yes	☐ No
Will **ALL** work be subcontracted?	☐ Yes	☐ No	Do you intend to use apprentice employees?	☐ Yes	☐ No

Number of Owner/Operators who own at least 30% of the company who will perform work on this project: ☐ None (0) ☐ One (1) ☐ Two (2) ☐ Three (3)

Crafts/Trades/Occupations – (Do not list apprentices. They are listed on the Affidavit of Wages Paid only.) If an employee works in more than one trade, ensure that all hours worked in each trade are reported below. For additional crafts/trades/occupations please use Addendum A.	**Number of Workers**	**Rate of Hourly Pay**	**Rate of Hourly Usual ("Fringe") Benefits**
9	10	11	12

Signature Block

I hereby certify that I have read and understand the instructions to complete this form. That the information, including any addendum(s), are correct and that all workers I employ on this Public Works Project will be paid no less than the Prevailing Wage Rate(s) as determined by the Industrial Statistician of the Department of Labor and Industries.

Print Name:	**Print Title:**	**Signature:**	**Date:**

For L&I Use Only

Approved by the Department of Labor and Industries Industrial Statistician

NOTICE: If the prime contract is at a cost of over one million dollars ($1,000,000.00), RCW 39.04.370 requires you to complete the EHB 2805 (RCW 39.04.370) Addendum and attach it to your Affidavit of Wages of Paid when your work on the project concludes. This is only a notice. The EHB 2805 Addendum is not submitted with this Intent.

Department of Labor & Industries
Prevailing Wage Program
P.O. Box 44540
Olympia, Washington 98504-4540
Phone (360) 902-5335 / Fax (360) 902-5300

INSTRUCTIONS
STATEMENT OF INTENT TO PAY PREVAILING WAGES
FOR PUBLIC WORKS CONTRACTS

COMPLETE ALL FIELDS ON THE FORM

The numbered blocks in the following instructions correspond to the numbered Statement of Intent to Pay Prevailing Wage above. In addition a completed sample form (without numbers) is included at the end of these instructions.

1 **Your Company Information -** Enter the following information:

a) Your **Company Name** and **Address**.

b) Your **Contractor Registration Number** – You can verify this number at: https://fortress.wa.gov/lni/bbip/Search.aspx.

c) Your **UBI Number** (Unified Business Identifier) – This 9-digit number registers you with several state agencies and allows you to do business in Washington. You can verify this number at: https://fortress.wa.gov/dol/dolprod/bpdLicenseQuery/.

d) Your **Industrial Insurance Account Number** – You can verify this number at: https://fortress.wa.gov/lni/crpsi/MainMenu.aspx?MessageId=2001.

e) Please provide your **Email Address** so that L&I can notify you of form approval and/or any required corrections. If you do not provide this information, L&I will use standard mail to send you correction notices. You can access approved forms at: https://fortress.wa.gov/lni/pwiapub/SearchFor.asp. No notice of approval will be mailed.

f) Your company **Phone Number**.

2 **Awarding Agency Information –** Enter the following information regarding the agency that awarded the contract. This information is available from the Prime Contractor:

a) **Project Name** – This is the name the Awarding Agency assigned to the project.

b) **Contract Number** – This is the number the Awarding Agency assigned to the project.

c) **Awarding Agency** – This is the name of the agency that awarded the contract.

d) Please enter the **Street Address**, **City**, **State** and **Zip+4** for the Awarding Agency.

e) **Awarding Agency Contact Name and Phone Number** – Enter the name and phone number of the person the Prime Contractor communicates with at the Awarding Agency.

f) **County Where Work Will Be Performed** – Enter the name of the county where the work will be performed. If the work will be performed in multiple counties, include the names of all counties where work will be performed.

g) **City Where Work Will Be Performed** – Enter the name of the city where the work will be performed. If the work will be performed outside the limits of any city, or in multiple cities, include the name of the nearest city.

3 **Additional Details**

a) **Your Expected Job Start Date** – This is the date that you expect to begin work on the project.

b) **Job Site Address/Directions –** Enter the specific address of the project or provide brief details regarding the location of the site, if no specific address exists.

4

Contract Details

a) **Bid Due Date** – Enter the date the **Prime Contractor** had to submit the bid to the Awarding Agency for this project (mm/dd/yyyy).

- **What if my contract was not bid?** – If the contract you will be working under was not required to be bid, you will enter the date the contract was awarded.

b) **Award Date** – This is the date the awarding agency awarded the contract to the **Prime Contractor** (mm/dd/yyyy).

c) **Indicate the Total Dollar Amount of Your Contract –** Enter the dollar amount of **your** contract, including the applicable sales tax. If this is a "time and materials" contract, please indicate this by checking the box next to "T&M."

5

ARRA & Weatherization Funding Questions – Enter the information regarding the source of funds. This information should be obtained from the Awarding Agency or the Prime Contractor.

a) Does this project utilize American Recovery and Reinvestment Act (ARRA) funds?

b) Does this project utilize any weatherization or energy efficiency upgrade funds (ARRA or otherwise)?

6

Prime Contractor's Company Information – Enter the information about the contractor who has the direct contract with the Awarding Agency:

a) **Prime Contractor's Company Name** – Enter the Prime Contractor's company name.

b) **Prime Contractor's Intent ID Number** – Enter the Prime Contractor's Approved Intent ID Number.

c) **Prime Contractor's Registration Number** – Enter the Contractor Registration Number for the Prime Contractor. You can verify the number at: https://fortress.wa.gov/lni/bbip/Search.aspx.

d) **Prime Contractor's UBI Number** – Enter the UBI number for the Prime Contractor. You can verify this number at: https://fortress.wa.gov/dol/dolprod/bpdLicenseQuery/.

7

Hiring Contractor's Company Information – Enter the information about the Hiring Contractor. This is the contractor who hired or contracted your firm to perform work on this project:

a) **Hiring Contractor's Company Name** – Enter the company name of the contractor who hired or contracted with your firm to perform work on this project.

b) **Hiring Contractor's Registration Number** – Enter the Contractor Registration Number for the contractor who hired you. You can verify the number at: https://fortress.wa.gov/lni/bbip/Search.aspx.

c) **Hiring Contractor's UBI Number** – Enter the UBI Number for the contractor who hired you. You can verify this number at: https://fortress.wa.gov/dol/dolprod/bpdLicenseQuery/.

8

Employment Information – Enter information about the individuals who will perform work on this project:

a) **Do you intend to use subcontractors?** – If **PART** of the work will be performed by subcontractors you will hire, check the "Yes" box.

b) **Will employees perform work on this project? -** If employees, including apprentices, will perform any work on the project, check the "Yes" box and list each employee's applicable craft/trade/occupation. Do not list the actual apprentice, just the craft/trade/occupation the apprentice will be working in. Also, please note the information regarding apprentices in "d" below. **If you choose "No" and this changes later, you certify that you will submit a new Intent form listing workers.**

c) **Will All work be subcontracted?** – If **ALL** work will be performed by subcontractors, check the "Yes" box.

d) **Do you intend to use apprentice employees?** – If you plan to employ apprentices on this project please be aware:

- Any workers **NOT** registered with the Washington State Apprenticeship and Training Council (WSATC) must be paid the correct journey-level prevailing rate of wage.
- Any apprentice **NOT** registered with the WSATC within 60 days of hiring must be paid at the correct journey-level prevailing rate of wage for the time preceding the date of registration.

- You **must** be a registered training agent with the WSATC in order to pay a registered apprentice less than journey-level prevailing rate of wage.
- To verify apprenticeship and/or registered training agent status call (360) 902-5324.

e) **Number of Owners/Operators who own at least 30% of the company who will perform work on this project –** Indicate the number of Owners/Operator(s) who will perform work on this project. If no 30%+ Owners/Operators will perform work on the project, check the box "None".

Crafts/Trades/Occupations – List each craft/trade/occupation of all workers you plan to employ on this project.

❖ **Crafts/Trades/Occupations**

If you indicated above that Owners/Operators will work on this project, and you also indicated above that no employees will perform work on the project, or **ALL** work will be subcontracted, then you do not need to fill in this section. (Individuals who own less than 30% of the company are not considered to be Owners/Operators, and must be listed as employees and paid the correct prevailing rate of wage.)

Use **Addendum A** for additional Crafts/Trades/Occupations that will not fit on this form.

Residential Construction – If you are using any residential classifications (e.g. Residential Carpenter, Residential Laborer, etc.) you must provide information regarding the following questions, on **Addendum C**, in order for L&I to determine if residential rates are being utilized appropriately:

1. Did the Awarding Agency, in compliance with RCW 39.12.030, determine that the project/work contracted for meets the definition of residential construction?
2. Please indicate the type of structure (e.g. single-family dwelling, duplex, apartment, condominium or other residential structure).
3. Including any basement or garage, how many stories or levels does the structure have?
4. What is the facility used for? - Answer "yes" or "no" to each of the following options:
    a. Permanent residence only?
    b. Rehabilitation house?
    c. Transitional housing?
    d. Communal dining facility?
    e. Treatment services?
    f. Counseling?
    g. Other?
5. Does each dwelling unit have its own full, self-contained kitchen?
6. Does each dwelling unit have its own full bathroom?
7. Is there a community facility or manager's office on site?
8. Is any part of the facility used by members of the public?

Landscape Construction – If you are using "Landscape Construction" or any of the sub-classifications within Landscape Construction (e.g., Landscape or Planting Laborer, Irrigation or Lawn Sprinkler Installers, or Landscape Equipment Operators or Truck Drivers) you must provide information on **Addendum C** regarding the following aspects of the work in order for L&I to determine if you are appropriately applying Landscape Construction rates:

1. The beautification of a plot of land through addition of or modification to lawns, trees and bushes under the Landscape Construction Scope of Work (WAC 296-127-01346) is a limited universe and has exclusions that may affect its application. Please provide L&I with the following information so we can verify whether the landscape construction wage rates apply to this project.
    a. Please describe the whole project – not just your part.
    b. Please describe your part(s) of the project – the tasks you performed, equipment used, and tools used. Please provide as much detail as you can.

c. If the project involves installing an irrigation system, trenching, installing French drains or other subsurface water collection systems, or spreading top soil or mulch, please tell us the relevant depths.

2. If Operating Engineers and/or Truck Drivers will be used in addition to Landscape Construction, describe the type of equipment used, and list the size or rated capacity of the equipment.

10 **Number of Workers** – Enter the number of journey-level workers you plan to employ on this project for that craft/trade/occupation.

11 **Rate of Hourly Pay** – Enter the rate of hourly pay as defined by RCW 39.12.010, that you will actually pay the worker(s) for that craft/trade/occupation. The amount listed for "Rate of Hourly Pay" plus the amount listed for the "Rate of Hourly Fringe Benefits," if any, must equal or exceed the applicable prevailing rate of wage.

12 **Rate of Hourly Usual ("Fringe") Benefits** – Enter the rate of hourly Usual ("fringe") Benefits for that craft/trade/occupation. This is the cost of usual benefits, as defined by RCW 39.12.010, that you will actually pay the worker(s). The amount listed for "Rate of Hourly Pay" plus the amount listed for "Rate of Hourly Usual ("Fringe") Benefits," if any, must equal or exceed the applicable prevailing rate of wage.

If there is not enough space to list all required information on one form, use the appropriate Addendum as needed. No additional fee is required for using Addendums to the form. No other attachments will be accepted.
L&I's approval of your Statement of Intent to Pay Prevailing Wages is based on the information you provide. Approval of the form does not signify that the classifications of labor you listed on the form are the correct classifications of work for the tasks performed on the public works project. It is your responsibility to pay workers the prevailing rate of wage for the classification of work that correctly applies to the actual work they perform.

Be sure to include your email address on the form. **If you do not provide this information, L&I will use standard mail to send you correction notices. You will be able to access approved forms at: https://fortress.wa.gov/lni/pwiapub/SearchFor.asp (No notice of approval will be mailed)**.

Prevailing wage rates are available on the Internet at:

http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp

MAILING INSTRUCTIONS

You must mail the completed and signed form with ***original signature*** *(a photocopy of a signature will* ***not*** *be accepted) with the $40 filing fee to:*

Management Services
Department of Labor & Industries
Prevailing Wage Program
PO Box 44835
Olympia, WA 98504-4835

FURTHER INFORMATION

Make checks payable to:

Department of Labor and Industries

If you have questions or would like assistance in completing the form, please call us at ***(360) 902-5335*** *or email the Prevailing Wage office at pw1@Lni.wa.gov.*

Department of Labor and Industries
Prevailing Wage
(360) 902-5335
www.lni.wa.gov/TradesLicensing/PrevWage

STATEMENT OF INTENT TO PAY PREVAILING WAGES

Public Works Contract
$40.00 Filing Fee Required

- This form **must** be typed or printed in ink.
- **Fill in all blanks or the form will be returned for correction (see instructions).**
- Please allow a **minimum** of 10 working days for processing.
- Once approved, your form will be posted online at https://fortress.wa.gov/lni/pwiapub/SearchFor.asp

Intent ID # (Assigned by L&I)_____

Your Company Information		
Your Company Name ABC Company, Inc.		
Your Address 1234 Main Street		
City Olympia	State WA	Zip+4 98501-1234
Your Contractor Registration Number ABCCI*0123AA	Your UBI Number 123456789	
Your Industrial Insurance Account Number 111,111-11		
Your Email Address (required for notification of approval) prevailingwage@lni.wa.gov	Your Phone Number (555) 555-5555	

Awarding Agency Information		
Project Name Road Repair	Contract Number 2011-01B	
Awarding Agency WA State Department of Transportation		
Awarding Agency Address PO Box 47354		
City Olympia	State WA	Zip+4 98501
Awarding Agency Contact Name John Doe	Phone Number (555) 555-5555	
County Where Work Will Be Performed Thurston	City Where Work Will Be Performed Olympia	

Additional Details	
Your Expected Job Start Date (mm/dd/yyyy) 01/01/2011	
Job Site Address/Directions State Street @ Plum Street	

Contract Details	
Bid Due Date (**Prime Contractor's**) 08/01/2010	Award Date (**Prime Contractor's**) 08/10/2010
Indicate Total Dollar Amount of **Your** Contract (including sales tax) or time and materials, if applicable.	$1000.00

ARRA Funds	**Weatherization or Energy Efficient Funds**
Does this project utilize American Recovery and Reinvestment Act (ARRA) funds? ☐ Yes ☒ No	Does this project utilize any weatherization or energy efficiency upgrade funds (ARRA or otherwise)? ☐ Yes ☒ No

Prime Contractor's Company Information		**Hiring Contractor's Company Information**	
Prime Contractor's Company Name XYZ Company, Inc.	Prime Contractor's Intent Number 123456	Hiring Contractor's Company Name Super Pavers, Inc.	
Prime Contractor's Registration Number XYZIN*0123AA	Prime Contractor's UBI Number 987654321	Hiring Contractor's Contractor Registration Number SUPERPA123AA	Hiring Contractor's UBI Number 321456987

Employment Information					
Do you intend to use **ANY** subcontractors?	☐ Yes	☒ No	Will employees perform work on this project?	☒ Yes	☐ No
Will **ALL** work be subcontracted?	☐ Yes	☒ No	Do you intend to use apprentice employees?	☒ Yes	☐ No

Number of Owner/Operators who own at least 30% of the company who will perform work on the project: ☐ None (0) ☒ One (1) ☐ Two (2) ☐ Three (3)

Crafts/Trades/Occupations – (Do not list apprentices. They are listed on the Affidavit of Wages Paid only.) If an employee works in more than one trade, ensure that all hours worked in each trade are reported below. For additional crafts/trades/occupations please use Addendum A.	**Number of Workers**	**Rate of Hourly Pay**	**Rate of Hourly Usual ("Fringe") Benefits**
Laborer - Asphalt Raker	**2**	**39.28**	**5.00**
Power Equipment Operator - Asphalt Plant Operator	**1**	**48.04**	**2.35**
Truck Driver - Asphalt Mix (over 16 Yds)	**1**	**46.47**	**0.00**

Signature Block

I hereby certify that I have read and understand the instructions to complete this form and that the information, including any addenda, are correct and that all workers I employ on this Public Works Project will be paid no less than the Prevailing Wage Rate(s) as determined by the Industrial Statistician of the Department of Labor and Industries.

Print Name:	**Print Title:**	**Signature:**	**Date:**

For L&I Use Only

Approved by signature of the Department of Labor and Industries Industrial Statistician

NOTICE: If the prime contract is at a cost of over one million dollars ($1,000,000.00), RCW 39.04.370 requires you to complete the EHB 2805 (RCW 39.04.370) Addendum and attach it to your Affidavit of Wages of Paid when your work on the project concludes. This is only a notice. The EHB 2805 Addendum is not submitted with this Intent.

SECTION 00 71 20

DAVIS BACON
WAGE DETERMINATION

1.1 SUMMARY

A. Document Includes:
1. Davis Bacon Wage Determination downloaded on 6/22/2022 from https://sam.gov/wage-determination/WA20220097/1.

1.2 WAGE RATES:

A. "General Decision Number: WA20220097 02/25/2022

B. Superseded General Decision Number: WA20210097

C. State: Washington

D. Construction Type: Residential

E. County: Yakima County in Washington.

1.3 RESIDENTIAL CONSTRUCTION PROJECTS:

A. Consisting of single family homes and apartments up to and including 4 stories.

B. Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

C. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

D. If the Contract is entered into on or after January 30, 2022, or the contact is renewed or extended on or after January 30, 2022:
1. Executive Order 14026 generally applies to the contract.
2. The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.

E. The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

F. Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts

1.4 PUBLICATION DATE:

A. Modification 0: 01/07/2022

B. Modification 1: 02/25/2022

BRWA0001-001 06/01/2021

	Rates	Fringes
BRICKLAYER.....	$ 33.95	19.33

CARP0770-035 06/01/2020

	Rates	Fringes
CARPENTER.....	$ 31.35	14.53

LABO0238-001 06/01/2019

	Rates	Fringes
LABORER (Mason Tender - Cement/Concrete).....	$ 28.21	13.00

LABO0242-001 06/10/2021

	Rates	Fringes
LABORER (Mason Tender - Brick)...	$ 42.98	13.19

PLAS0478-001 06/01/2020

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...$ 31.30	15.53	

SHEE0066-052 06/01/2017

	Rates	Fringes
SHEET METAL WORKER (Excluding HVAC Duct Installation).....	$ 34.75	20.68

TEAM0690-012 01/01/2019

	Rates	Fringes
TRUCK DRIVER		
GROUP 3.....	$ 28.16	17.40
GROUP 4.....	$ 28.49	17.40
GROUP 5.....	$ 28.60	17.40
GROUP 6.....	$ 28.76	17.40
GROUP 7.....	$ 29.30	17.40
GROUP 8.....	$ 29.62	17.40

TRUCK DRIVERS CLASSIFICATIONS

- GROUP 3: Trucks, side, end, bottom and articulated end dump (3 yards to and including 6 yds.)

- GROUP 4: Trucks, side, end, bottom and articulated end dump (over 6 yds. to & including 12 yds.)
- GROUP 5: Trucks, side, end, bottom and articulated end dump (over 12 yds. to & including 20 yds.)
- GROUP 6: Trucks, side, end, bottom and articulated end dump (over 20 yds. to & including 40 yds.)
- GROUP 7: Truck, side, end, bottom and articulated end dump (over 40 yds. to & including 100 yds.)
- GROUP 8: Trucks, side, end, bottom and articulated end dump (over 100 yds.)

FOOTNOTE A - Anyone working on a HAZMAT job, where HAZMAT cerfification is required, shall be compensated as a premium, in addition to the classification working in as follows:

- LEVEL C-D: - $.50 PER HOUR - This level may use an air purifying respirator or additional protective clothing.
- LEVEL A-B: - $1.00 PER HOUR - Uses supplied air in conjunction with a chemical splash suit or fully encapsulated suit with a self-contained breathing apparatus.

Employees shall be paid Hazmat pay in increments of four(4) and eight(8) hours.

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* SUWA2011-017 06/27/2014

	Rates	Fringes
ELECTRICIAN.....	$ 35.16	16.58
LABORER: Common or General..	$ 14.45 **	1.30
OPERATOR: Backhoe/Excavator/Trackhoe..	$ 26.41	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	$ 17.53	0.00
OPERATOR: Bulldozer.....	$ 29.63	0.00
PAINTER (Brush, Roller, and Spray).....	$ 24.75	5.91
PLUMBER.....	$ 25.86	2.76
ROOFER.....	$ 23.12	2.90
SHEET METAL WORKER (HVAC Duct Installation Only)...	$ 20.84	7.30

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.
Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

1.5 Union Rate Identifiers

A. A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were

B. prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

C. Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

1.6 Survey Rate Identifiers

A. Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

B. Survey wage rates are not updated and remain in effect until a new survey is conducted.

1.7 Union Average Rate Identifiers

A. Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

B. A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals

1.8 WAGE DETERMINATION APPEALS PROCESS

A. Has there been an initial decision in the matter? This can be:
1. * an existing published wage determination
2. * a survey underlying a wage determination
3. * a Wage and Hour Division letter setting forth a position on
4. a wage determination matter
5. * a conformance (additional classification and rate) ruling

B. On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in D.) and F.) should be followed.

C. With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

D. If the answer to the question in A.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

E. The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

F. 3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

G. 4.) All decisions by the Administrative Review Board are final.

END OF SECTION

HUD-FEDERAL LABOR STANDARDS PROVISIONS
29 CFR 5.5 – CONTRACT PROVISIONS AND RELATED MATTERS

Note: Sections 2.4(b) and (c) apply only when the amount of the prime contract exceeds $100,000.

(a)(1)(i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project) will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made part hereof regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section l(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321)) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour

Division, Employment Standards Administration, U.S. Department of Labor, Washington, D. C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within the 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determinations or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractors under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due.

(3)(i) Payrolls and Basic Records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section l(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit ~~weekly for each week~~ monthly for each month in which any contract work is performed ~~a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party~~, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be~~, for transmission to HUD or its designee~~. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

(B) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR 5.5 (a)(3)(i) and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The ~~weekly~~ monthly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of Title 18 and section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4)(i) Apprentices and Trainees. Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeymen's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR part 3 which are incorporated by reference in this Agreement.

(6) Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in section 2.4(a)(1) through (11) and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section 2.4(a).

(7) Contract Terminations; Debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes Concerning Labor Standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29

CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U. S. Department of Labor, or the employees or their representatives.

(10)(i) Certification of Eligibility. By entering into this Agreement, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR part 24.

(ii) No part of this Agreement shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, section 1010, Title 18, U.S.C., "Federal Housing Administration transactions, provides in part: "Whoever, for the purpose of ...influencing in any way the action of such Administration...makes, utters or publishes any statement, knowing the same to be false... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Agreement are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Agreement to his employer.

(b) Contract Work Hours and Safety Standards Act. The provisions of this paragraph (b) are applicable only where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime Requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours

without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for Unpaid Wages and Liquidated Damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontractors. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

(c) Health and Safety. The provisions of this paragraph (c) are applicable only where the amount of the prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The contractor shall comply with all regulations issue by the Secretary of Labor pursuant to Title 29 part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

APPRENTICE FORM INSTRUCTIONS

Fruitvale Apartments receives a loan from State of Washington Dept. of Commerce and must meet the apprenticeship requirements featured below:

201.6. Use of the Apprenticeship Program

For projects with construction costs of at least $1 million, the HTF contractor must include apprentice training program requirements in their construction contractor bid package. The HTF contractor must also make best efforts to select a prime contractor that will hire apprentices enrolled in an approved apprenticeship program and who will procure sub-contractors who will also hire apprentices enrolled in an approved apprenticeship program as described in RCW 39.04.300 through 39.04.320. At least 15 percent of the labor hours must be performed by apprentices enrolled through the Washington State Apprenticeship and Training Council (WSATC).

The HTF contractor is required to acquire a completed "Statement of Apprenticeship/Journeyman Participation" form from the general contractor that includes subcontractor data. The HTF contractor must submit this form to the Washington Community Reinvestment Association (WCRA) and the HTF contract manager with each voucher request.

For more information regarding apprenticeship programs, please consult the Washington State Department of Labor and Industries Apprenticeship Programs website.

A sample form is attached immediately following this page, and a Microsoft Excel version of the file is also available upon request.

Department of General Administration

STATEMENT OF APPRENTICE/JOURNEYMAN PARTICIPATION

Firm Name, Address, City, State & ZIP+4	Project Name (Title)	Contract No.
	Fruitvale Apartments	number
	Contract Award Amount:	Notice to Proceed Date
	$0.00	8/30/2022

Reporting Period from: beginning date to end date

Apprenticeship Goal Percentage: 15%

APPRENTICE SUMMARY

Apprentice Name	Craft or Trade	Apprentice Registration Number	Name of Contractor or Sub-Contractor	Apprentice Total Number	Apprentice Hours Worked

JOURNEYMEN SUMMARY

	Craft or Trade		Name of Contractor or Sub-Contractor	Journeymen Total Number	Journeymen Hours Worked

Apprentice total hours worked this period:	0
Journeyman total hours worked this period:	0

	Previous Total	New Total	Percentage
Cumulative Apprentice hour Total brought forward from last reporting period:	previous total	#VALUE!	#VALUE!
Cumulative Journeymen hourTotal brought forward from last reporting period:	previous total	#VALUE!	

I, the undersigned, do hereby certify under penalty of perjury that the items listed herein represent the proper hourly totals for Apprenticeship/Journeyman participation during this reporting period.

Printed Name: Signature: Date: Title:

EAS Labor Form 010103

SECTION THREE CLAUSE

Code of Federal Regulations Title 24, Subtitle B, Chapter 1, Subchapter B, Part 135.38 Section 3 Clause:

The owner shall incorporate or cause to be incorporated into any contract or subcontract for work pursuant to this Agreement in excess of $100,000 the following clause:

(1) The work to be performed under this contract is subject to the requirements of section 3 of the Housing Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3 shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(2) The parties to this Agreement agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this Agreement, the parties to this Agreement certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

(3) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, and shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

(4) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

(5) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

(6) Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this Agreement for default, and debarment or suspension from future HUD assisted contracts.

(7) With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 405e) also applies to the work to be performed under this contract. Section 7(b) requires

that to the greatest extent feasible: (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprise. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

Section 3 Summary Report
Economic Opportunities for
Low- and Very Low-Income Persons

U.S. Department of Housing and Urban Development
Office of Fair Housing
and Equal Opportunity

OMB Approval No. 2529-0043
(exp. 8/31/2007)

HUD Field Office:

See back of page for Public Reporting Burden statement

1. Recipient Name & Address: (street, city, state, zip)	2. Federal Identification: (contract/award no.)	3. Dollar Amount of Award:
	4. Contact Person:	5. Phone: (include area code)
	6. Reporting Period:	7. Date Report Submitted:

8. Program Code: * [ ] (Use a separate sheet for each program code)

9. Program Name:

Part I: Employment and Training (** Include New Hires in columns E & F.)

A Job Category	B Number of New Hires	C Number of New Hires that are Sec. 3 Residents	D % of Aggregrate Number of Staff Hours of New Hires that are Sec. 3 Residents	E** % of Total Staff Hours for Section 3 Employees and Trainees	F** Number of Section 3 Employees and Trainees
Professionals					
Technicians					
Office/Clerical					
Construction by Trade (List) Trade					
Trade					
Trade					
Trade					
Trade					
Other (List)					
Total					

***Program Codes**

1 = Flexible Subsidy
2 = Section 202/811
3 = Public/Indian Housing
A = Development,
B = Operation
C = Modernization
4 = Homeless Assistance
5 = HOME
6 = HOME-State Administered
7 = CDBG-Entitlement
8 = CDBG-State Administered
9 = Other CD Programs
10 = Other Housing Programs

form **HUD-60002** (6/2001)
ref 24 CFR 135

Part II: Contracts Awarded

1. Construction Contracts:

A. Total dollar amount of all contracts awarded on the project	$
B. Total dollar amount of contracts awarded to Section 3 businesses	$
C. Percentage of the total dollar amount that was awarded to Section 3 businesses	%
D. Total number of Section 3 businesses receiving contracts	

2. Non-Construction Contracts:

A. Total dollar amount of all non-construction contracts awarded on the project/activity	$
B. Total dollar amount of non-construction contracts awarded to Section 3 businesses	$
C. Percentage of the total dollar amount that was awarded to Section 3 businesses	%
D. Total number of Section 3 businesses receiving non-construction contracts	

Part III: Summary

Indicate the efforts made to direct the employment and other economic opportunities generated by HUD financial assistance for housing and community development programs, to the greatest extent feasible, toward low- and very low-income persons, particularly those who are recipients of government assistance for housing. (Check all that apply.)

____ Attempted to recruit low-income residents through: local advertising media, signs prominently displayed at the project site, contacts with community organizations and public or private agencies operating within the metropolitan area (or nonmetropolitan county) in which the Section 3 covered program or project is located, or similar methods.

____ Participated in a HUD program or other program which promotes the training or employment of Section 3 residents.

____ Participated in a HUD program or other program which promotes the award of contracts to business concerns which meet the definition of Section 3 business concerns.

____ Coordinated with Youthbuild Programs administered in the metropolitan area in which the Section 3 covered project is located.

____ Other; describe below.

Form HUD-60002, **Section 3 Summary Report, Economic Opportunities for Low- and Very Low-Income Persons**.

Instructions: This form is to be used to report annual accomplishments regarding employment and other economic opportunities provided to low- and very low-income persons under Section 3 of the Housing and Urban Development Act of 1968. The Section 3 regulations apply to any ***public and Indian Housing programs*** that receive: (1) development assistance pursuant to Section 5 of the U.S. Housing Act of 1937; (2) operating assistance pursuant to Section 9 of the U.S. Housing Act of 1937; or (3) modernization grants pursuant to Section 14 of the U.S. Housing Act of 1937 and to ***recipients of housing and community development assistance in excess of $200,000*** expended for: (1) housing rehabilitation (including reduction and abatement of lead-based paint hazards); (2) housing construction; or (3) other public construction projects; and to ***contracts and subcontracts in excess of $100,000*** awarded in connection with the Section-3-covered activity.

Form HUD-60002 has three parts which are to be completed for all programs covered by Section 3. Part I relates to ***employment and training***, The recipient has the option to determine numerical employment/training goals either on the basis of the number of hours worked by new hires (columns B, D, E and F) or the number of new hires utilized on the Section 3 covered project (columns B, C and F). Part II of the form relates to ***contracting***, and Part III summarizes recipients' ***efforts*** to comply with Section 3.

Recipients or contractors subject to Section 3 requirements must maintain appropriate documentation to establish that HUD financial assistance for housing and community development programs were directed toward low- and very low-income persons.* A recipient of Section 3 covered assistance shall submit two copies of this report to the local HUD Field Office. Where the program providing assistance requires an annual performance report, this Section 3 report is to be submitted at the same time the program performance report is submitted. Where an annual performance report is not required, this Section 3 report is to be submitted by January 10 and, if the project ends before December 31, within 10 days of project completion. ***Only Prime Recipients are required to report to HUD. The report must include accomplishments of all recipients and their Section 3 covered contractors and subcontractors.***

HUD Field Office: Enter the Field Office name forwarding the Section 3 report.

1. Recipient: Enter the name and address of the recipient submitting this report.
2. Federal Identification: Enter the number that appears on the award form (with dashes). The award may be a grant, cooperative agreement or contract.
3. Dollar Amount of Award: Enter the dollar amount, rounded to the nearest dollar, received by the recipient.

4 & 5. Contact Person/Phone: Enter the name and telephone number of the person with knowledge of the award and the recipient's implementation of Section 3.

6. Reporting Period: Indicate the time period (months and year) this report covers.
7. Date Report Submitted: Enter the appropriate date.
8. Program Code: Enter the appropriate program code as listed at the bottom of the page.
9. Program Name:Enter the name of the HUD Program corresponding with the "Program Code" in number 8.

Part I: Employment and Training Opportunities

Column A: Contains various job categories. Professionals are defined as people who have special knowledge of an occupation (i.e., supervisors, architects, surveyors, planners, and computer programmers). For construction positions, list each trade and provide data in columns B through F for each trade where persons were employed. The category of "Other" includes occupations such as service workers.

Column B: Enter the number of new hires for each category of workers identified in **Column A** in connection with this award. New Hire refers to a person who is not on the contractor's or recipient's payroll for employment at the time of selection for the Section 3 covered award or at the time of receipt of Section 3 covered assistance.

Column C: Enter the number of Section 3 new hires for each category of workers identified in **Column A** in connection with this award. Section 3 new hire refers to a Section 3 resident who is not on the contractor's or recipient's payroll for employment at the time of selection for the Section 3 covered award or at the time of receipt of Section 3 covered assistance.

Column D: Enter the percentage of all the staff hours of new hires (Section 3 residents) in connection with this award.

Column E: Enter the percentage of the total staff hours worked for Section 3 employees and trainees (including new hires) connected with this award. Include staff hours for part-time and full-time positions.

Column F: Enter the number of Section 3 residents that were employed and trained in connection with this award.

Part II: Contract Opportunities

Block 1: Construction Contracts

Item A: Enter the total dollar amount of all contacts awarded on the project/program.

Item B: Enter the total dollar amount of contracts connected with this project/program that were awarded to Section 3 businesses.

Item C: Enter the percentage of the total dollar amount of contracts connected with this project/program awarded to Section 3 businesses.

Item D: Enter the number of Section 3 businesses receiving awards.

Block 2: Non-Construction Contracts

Item A: Enter the total dollar amount of all contacts awarded on the project/program.

Item B: Enter the total dollar amount of contracts connected with this project awarded to Section 3 businesses.

Item C: Enter the percentage of the total dollar amount of contracts connected with this project/program awarded to Section 3 businesses.

Item D: Enter the number of Section 3 businesses receiving awards.

Part III: Summary of Efforts - Self-explanatory

Submit two (2) copies of this report to the to the HUD Field Office of Fair Housing and Equal Opportunity, Program Operations and Compliance Center Director, at the same time the performance report is submitted to the program office. For those programs where such a report is not required, the Section 3 report is submitted by January 10. Include only contracts executed during the reporting period specified in item 8. PHAs/HAs are to report all contracts/subcontracts.

* The terms "low-income persons" and "very low-income persons" have the same meanings given the terms in section 3(b)(2) of the United States Housing Act of 1937. ***Low-income persons*** mean families (including single persons) whose incomes do not exceed 80 per centum of the median income for the area, as determined by the Secretary, with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher or lower than 80 per centum of the median for the area on the basis of the Secretary's findings such that variations are necessary because of prevailing levels of construction costs or unusually high- or low-income families. ***Very low-income persons*** mean low-income families (including single persons) whose incomes do not exceed 50 per centum of the median family income for the area, as determined by the Secretary with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher or lower than 50 per centum of the median for the area on the basis of the Secretary's findings that such variations are necessary because of unusually high or low family incomes.

Certification Regarding Debarment and Suspension

U.S. Department of Housing and Urban Development

Certification A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief that its principals;

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal debarment or agency;

b. Have not within a three-year period preceding this proposal, been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

d. Have not within a three-year period preceding this application/ proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Instructions for Certification (A)

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was place when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms **covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded**, as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of these regulations.

6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines this eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph (6) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

Certification B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Instructions for Certification (B)

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms **covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded**, as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of these regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph (5) of these instructions, if a participant in a lower covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies including suspension and/or debarment.

Applicant	Date

Signature of Authorized Certifying Official	Title

SECTION 00 74 10

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am

the _____ Secretary of the corporation

named as Principal in the within bond; that _____,

who signed the said bond on behalf of the Principal was then _____

_____ of said corporation; that I know his/her signature,

and his/her signature thereto is genuine, and that said bond was duly signed, and attested

to, for and in behalf of said corporation by authority of its governing body.

SIGNED _____

NAME _____

TITLE _____

DATE _____

END OF SECTION

SECTION 00 74 20

NON-COLLUSIVE AFFIDAVIT

A F F I D A V I T

STATE OF **WASHINGTON}** §
COUNTY OF **Yakima**}

_____, being first duly sworn, deposes and says:

That he is _____
(a partner or office of the Firm of, etc.)
_____
the party making the foregoing proposal or bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix overhead, profit or cost advantage against the **Yakima Housing Authority** or any person interested in the proposed contract; and that all statements in said proposal or bid are true.

Project:
Fruitvale Apartments
For **Yakima Housing Authority**

Name and Title of Bidder's Representative:

_____

_____

Signature of Contractor's Representative: _____

Subscribed and sworn to before me this _____ day of _____, 20___.

Notary Public Signature _____

Notary Public in and for the State of Washington residing at _____.
City

My commission expires _____, 20____.

END OF SECTION

NON DESCRIMINATION CLAUSE

Code of Federal Regulations, Title 41, Subtitle B, Chapter 60, 60-1.4 as amended 5/31/2022.

The owner shall incorporate or cause to be incorporated into any contract in excess of $10,000 for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR chapter 60, which is to be performed pursuant to this Agreement, the following nondiscrimination clause:

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, creed, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, creed, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, creed, sex, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which the contractor has a collective bargaining agreement or other contract or understanding, a notice to be provided by or at the direction of the Government advising the labor union or workers representative of the contractor’s commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and with the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by HUD and the

Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the rules, regulations, or orders, the contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions as may be imported and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor or as otherwise provided by law.

(8) The contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Government may direct as a means of enforcing such provisions including sanctions for noncompliance; provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Government, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

Equal Employment Opportunity is

THE LAW

Private Employers, State and Local Governments, Educational Institutions, Employment Agencies and Labor Organizations

Applicants to and employees of most private employers, state and local governments, educational institutions, employment agencies and labor organizations are protected under Federal law from discrimination on the following bases:

RACE, COLOR, RELIGION, SEX, NATIONAL ORIGIN

Title VII of the Civil Rights Act of 1964, as amended, protects applicants and employees from discrimination in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment, on the basis of race, color, religion, sex (including pregnancy), or national origin. Religious discrimination includes failing to reasonably accommodate an employee's religious practices where the accommodation does not impose undue hardship.

DISABILITY

Title I and Title V of the Americans with Disabilities Act of 1990, as amended, protect qualified individuals from discrimination on the basis of disability in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. Disability discrimination includes not making reasonable accommodation to the known physical or mental limitations of an otherwise qualified individual with a disability who is an applicant or employee, barring undue hardship.

AGE

The Age Discrimination in Employment Act of 1967, as amended, protects applicants and employees 40 years of age or older from discrimination based on age in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment.

SEX (WAGES)

In addition to sex discrimination prohibited by Title VII of the Civil Rights Act, as amended, the Equal Pay Act of 1963, as amended, prohibits sex discrimination in the payment of wages to women and men performing substantially equal work, in jobs that require equal skill, effort, and responsibility, under similar working conditions, in the same establishment.

GENETICS

Title II of the Genetic Information Nondiscrimination Act of 2008 protects applicants and employees from discrimination based on genetic information in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. GINA also restricts employers' acquisition of genetic information and strictly limits disclosure of genetic information. Genetic information includes information about genetic tests of applicants, employees, or their family members; the manifestation of diseases or disorders in family members (family medical history); and requests for or receipt of genetic services by applicants, employees, or their family members.

RETALIATION

All of these Federal laws prohibit covered entities from retaliating against a person who files a charge of discrimination, participates in a discrimination proceeding, or otherwise opposes an unlawful employment practice.

WHAT TO DO IF YOU BELIEVE DISCRIMINATION HAS OCCURRED

There are strict time limits for filing charges of employment discrimination. To preserve the ability of EEOC to act on your behalf and to protect your right to file a private lawsuit, should you ultimately need to, you should contact EEOC promptly when discrimination is suspected:

The U.S. Equal Employment Opportunity Commission (EEOC), 1-800-669-4000 (toll-free) or 1-800-669-6820 (toll-free TTY number for individuals with hearing impairments). EEOC field office information is available at www.eeoc.gov or in most telephone directories in the U.S. Government or Federal Government section. Additional information about EEOC, including information about charge filing, is available at www.eeoc.gov.

Employers Holding Federal Contracts or Subcontracts

Applicants to and employees of companies with a Federal government contract or subcontract are protected under Federal law from discrimination on the following bases:

RACE, COLOR, RELIGION, SEX, NATIONAL ORIGIN

Executive Order 11246, as amended, prohibits job discrimination on the basis of race, color, religion, sex or national origin, and requires affirmative action to ensure equality of opportunity in all aspects of employment.

INDIVIDUALS WITH DISABILITIES

Section 503 of the Rehabilitation Act of 1973, as amended, protects qualified individuals from discrimination on the basis of disability in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. Disability discrimination includes not making reasonable accommodation to the known physical or mental limitations of an otherwise qualified individual with a disability who is an applicant or employee, barring undue hardship. Section 503 also requires that Federal contractors take affirmative action to employ and advance in employment qualified individuals with disabilities at all levels of employment, including the executive level.

DISABLED, RECENTLY SEPARATED, OTHER PROTECTED, AND ARMED FORCES SERVICE MEDAL VETERANS

The Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended, 38 U.S.C. 4212, prohibits job discrimination and requires affirmative action to employ and advance in employment disabled veterans, recently separated veterans (within three years of discharge or release from active duty), other protected veterans (veterans who served during a war or in a campaign or expedition for which a campaign badge has been authorized), and Armed Forces service medal veterans (veterans who, while on active duty, participated in a U.S. military operation for which an Armed Forces service medal was awarded).

RETALIATION

Retaliation is prohibited against a person who files a complaint of discrimination, participates in an OFCCP proceeding, or otherwise opposes discrimination under these Federal laws.

Any person who believes a contractor has violated its nondiscrimination or affirmative action obligations under the authorities above should contact immediately:

The Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210, 1-800-397-6251 (toll-free) or (202) 693-1337 (TTY). OFCCP may also be contacted by e-mail at OFCCP-Public@dol.gov, or by calling an OFCCP regional or district office, listed in most telephone directories under U.S. Government, Department of Labor.

Programs or Activities Receiving Federal Financial Assistance

RACE, COLOR, NATIONAL ORIGIN, SEX

In addition to the protections of Title VII of the Civil Rights Act of 1964, as amended, Title VI of the Civil Rights Act of 1964, as amended, prohibits discrimination on the basis of race, color or national origin in programs or activities receiving Federal financial assistance. Employment discrimination is covered by Title VI if the primary objective of the financial assistance is provision of employment, or where employment discrimination causes or may cause discrimination in providing services under such programs. Title IX of the Education Amendments of 1972 prohibits employment discrimination on the basis of sex in educational programs or activities which receive Federal financial assistance.

INDIVIDUALS WITH DISABILITIES

Section 504 of the Rehabilitation Act of 1973, as amended, prohibits employment discrimination on the basis of disability in any program or activity which receives Federal financial assistance. Discrimination is prohibited in all aspects of employment against persons with disabilities who, with or without reasonable accommodation, can perform the essential functions of the job.

If you believe you have been discriminated against in a program of any institution which receives Federal financial assistance, you should immediately contact the Federal agency providing such assistance.

SECTION 00 91 05

ADDENDA AND MODIFICATIONS PREAMBLE

PART 1 GENERAL

1.1 This Section includes and provides binding-in or listing location for modifications, deletions, and additions to the Contract, as they occur.

A. Such items are incorporated in the Contract by:
1. Addenda issued before execution of the agreement.
2. Change Orders issued after execution of the agreement.

B. Actual binding-in of these documents is optional, but may be found convenient for ready reference.

END OF SECTION

SECTION 01 06 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Regulatory Requirements.

1.2 REQUIREMENTS

A. The Contractor is required to comply with all laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the work. And this includes modifications, amendments, additions, and the like, current as of contract date. Compliance requirements include, but are not limited to, following:

1. International Building Code and Related IBC Standards, 2018 edition, published by the International Conference of Building Officials and amended by the City of Yakima.
2. ANSI A117.1 Accessible and Usable Buildings and Facilities, current edition.
3. The Life Safety Code, NFPA, current edition.
4. Fire doors/windows, NFPA 80-2007, or most current edition.
5. Rules and regulations for the Yakima County Health Department.
6. Department of Labor and Industries Regulations.
7. Mechanical work:
    a. International Mechanical Code, 2018 edition.
    b. Uniform Plumbing Code, 2018 edition.
8. International Fire Code, 2018 edition.
9. Electrical work:
    a. 2018 National Electrical Code (NFPA 70)
    b. International Electrical Code, 2018 edition.
    c. Underwriters' Laboratories (UL).
    d. National Manufacturers' Association.
    e. NFPA, National Electric Code (NEC), National Electric Safety Code, and above electrical as applicable.
    f. International City Light Requirements for Electric Service.
10. Environmental requirements:
    a. All work to be performed in compliance with relevant statutes and regulations dealing with prevention of environmental pollution and preservation of public natural resources.
    b. All work to be performed in compliance with State of Washington Evergreen Sustainable Development Standard version 4.0. The contractor shall comply with all mandatory criteria of the Evergreen Sustainable Development Standard, and with the optional criteria indicated in specification section 01 81 13.
11. Energy requirements: Comply with insulation and energy conservation requirements of the 2018 Washington State Energy Code and the

Washington State Ventilation and Indoor Air Quality Code (current edition).

12. For governing authorities/asbestos removals, see reports of special consultants to the Owner.
13. Standard Specifications for Municipal Public Works Construction (current edition), Washington State Chapter, American Public Works Association.
14. Yakima Right-of-Way Improvements Manual, current edition.
15. Yakima Urban Area Zoning Ordinance, Title 15 of the Yakima Municipal Code, Current Edition.

B. The Owner requires immediate notification from the Contractor of any requirement of fees or charges imposed upon the work from any Governmental or Utility agencies. Fees paid by the Contractor to such agencies may have already been paid by the Owner, and without prior approval of the Owner will not be reimbursed by the Owner.

C. Specifications of Higher Standards: Drawings and specifications govern whenever drawing and specifications require higher standards than are required by governing codes, regulations, and the like.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 10 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract description.

B. Owner supplied products.

C. Specification Conventions.

1.2 CONTRACT DESCRIPTION

A. Work of the Project includes the construction of a new four-story apartment building.

1. The apartment building will be wood framed construction.
2. The project will include site work as shown on Architectural, Landscape and Civil plans. The site work will include sidewalk improvements, parking lot, pedestrian paths, landscaping and below grade storm water infiltration structures.
3. Fire protection piping shown on the Civil plans is shown for the purpose of coordination with other utilities. This portion of the site utility and interior mechanical systems is not covered by the building permit. The design and installation of this system is the responsibility of the General Contractor and Fire Protection subcontractor, who shall provide the design and licensure required by the City of Yakima and the Yakima Fire Department to install this system, exterior and interior parts.
4. Existing gas service piping will be removed.
5. Work is required in the Fruitvale right-of-way adjacent to the site as shown on Civil plans. This will include excavations for utilities, new curb cuts, and curb and sidewalk repair.
6. The land and facilities adjacent to this project are not part of this work and are not available to this contractor or sub-contractors for any purpose except to construct the work shown. Use of adjacent property for construction purposes, if any, and the written approval of those property owners is the responsibility of the Contractor(s).
7. See Division 00, Supplemental Conditions, for delineation of permit responsibilities.
8. The site has not been excavated or remediated. Hazardous materials and contaminated soils are present on site per the Phase 1 and Phase 2 Environmental Assessments produced by Fulcrum Environmental Consulting. Contractor is responsible for asbestos abatement and removal and disposal of contaminated soil. See specification section 02 81 00 for requirements for contaminated soil.
9. Existing buildings may contain asbestos and lead. The contractor is responsible for asbestos abatement and disposal of lead contaminated materials.
10. Contractor is responsible for testing and commissioning including:
    a. Commissioning required by Washington State Energy Code C408.

b. Air barrier testing per WSEC C402.5.1.2.
c. Additional commissioning required by Evergreen Sustainable Development Standards outlined in specification section 01 81 13.

1.3 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

1.4 DEFINITIONS

A. First-Class Workmanship: First-class workmanship is expected; that is not intended to demand “deluxe” work, but only to guard against and prevent poor workmanship.
   1. Before installing any item or material, verify that receiving surfaces are plumb, level, true to line, and straight to the degree necessary to achieve tolerances specified or required. Perform without extra cost all shimming, blocking, grinding, or patching required to make such surfaces plumb, level, true to line, and straight.
   2. Take care in attention to details and fitting at intersections and junctures of materials. All joints are to be tight, straight, even, and smooth.

B. Manufacturer’s Recommendations: Unless otherwise noted or directed, install all work in accordance with each manufacturer’s recommendations for best results. Not one preparatory step or installation procedure may be omitted unless specifically modified or exempted by these documents. Where more than one manufacturer is involved in the work or its component parts, Contractor must follow all manufacturers’ directions and recommendations, Contractor shall submit discrepancy or conflict to Architect for resolution and instruction.
   1. Conflict between manufacturer’s recommendations and these documents: Should any provision of these documents be in conflict with manufacturer’s or manufacturers’ recommendation, immediately notify Architect. Do not proceed until written authorization is received.

C. Specialist: An individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field). This individual or firm must be regularly engaged in and maintain a regular force of workers skilled in (as applicable) manufacturing, fabricating, or otherwise performing required work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cash allowances.
B. Schedule of values.
C. Applications for payment.
D. Defect assessment.
E. Unit prices.
F. Alternates.
G. Change Procedures.

1.2 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts; delivery to site and applicable taxes.
B. Costs Not Included in Cash Allowances But Included in Contract Sum/Price: Product handling at site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.
C. Architect Responsibilities:
    1. Consult with Contractor for consideration and selection of products.
    2. Select products in consultation with Owner and transmit decision to Contractor.
    3. Prepare Change Order.
D. Contractor Responsibilities:
    1. Assist Architect in selection of products, suppliers and installers.
    2. Obtain proposals from suppliers and installers and offer recommendations.
    3. On notification of selection by Architect, execute purchase agreement with designated supplier and installer.
    4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
    5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
    6. Coordinate pertinent related requirements/work specified in other parts of the Project Manual and modify surrounding work as required to properly integrate the work under each Allowance, and to provide complete construction required by Contract Documents.
E. Differences in costs will be adjusted by Change Order.
    1. Contractor shall maintain thorough records for the work specified under the referenced allowances and shall certify its accuracy.

2. Comparison of Actual Cost of Work:
   a. Cost of the work less than allowance: The Contractor shall return the remaining sum, including overhead and profit, to the Owner by means of credit against additional work or direct payment.
   b. Cost of the work exceeding allowance: The Owner will reimburse by Change Order the difference between this cost and the reviewed/approved cost of the installation, including overhead and profit.

F. Allowances Schedule:
   1. None.

1.3 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702. Contractor's standard form or approved electronic media printout will be considered.

B. Submit Schedule of Values within fifteen (15) days after date of Owner-Contractor Agreement. Submit together with list of Sub-Contractors and materials suppliers.

C. Format:
   1. Identify each line item with number and title of respective major specifications section.
   2. Include in each item a directly proportionate amount of Contractor’s overhead and profit.
   3. For items on which progress payments will be requested for stored materials, break down the cost into the cost of materials, delivered and unloaded, with taxes and the like paid, and indicate total installed value.
   4. At owner’s request for each line item of installed value exceeding $50,000, show breakdown by major products or operations under each item.
   5. Round off figures to nearest dollar amount.
   6. Make sum of total scheduled costs equal to contract sum.

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

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

1.4 APPLICATIONS FOR PAYMENT

A. Submit electronic copy of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702. Contractor's electronic media driven form will be considered.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
   1. Each Application for Payment shall be consistent with the previous applications and payments as certified by the Architect and Owner.
   2. Complete all form entries including execution by person authorized to sign legal documents on behalf of the Owner and Contractor. Incomplete applications will be returned without action.

3. All information to be typewritten.
4. Round entries to the nearest dollar amount. If no work has been performed enter “0”.
5. Include Change Orders approved prior to Application submittal date. List at bottom of scheduled values, list by Change Order number and brief description with approved value. Do not change original schedule of values entries to reflect changes to the work.
6. The responsible officer of Contractor’s firm shall sign all copies. Scanned color copies are permitted.

C. Additional documents to be Submitted with application:
1. Submit with transmittal letter as specified for Submittals in Section 01 33 00 - Submittal Procedures.
2. Submit updated construction schedule with each Application for Payment.
3. Submit updated construction waste management information as specified in Section 01 50 05 with each Application for Payment.
4. Submit partial lien releases from the Contractor and each sub-contractor and supplier. Lien releases may be conditioned upon payment for the amount requested.
5. Submit apprenticeship participation documentation.
6. Submit certifications for HUD Section 3 and prevailing wage rate compliance.
7. Affidavits attesting to off-site stored products.
8. Construction progress schedules, revised and current as specified in Section 01 32 16.

D. Substantiating Data: When Architect requires substantiating information, submit data justifying dollar amounts in question.
1. Upon request, provide electronic copies of record documents as specified in Section 01 70 00 for review by the Architect or Owner.

E. Payment Period: Submit at intervals stipulated in the Agreement.
1. The date for each progress payment is generally the last day of each month, to be confirmed at the initial construction meeting.

F. Submittal Procedures
1. Submit draft copy of the Application for payment via email or delivery to the Architect and Owner at least one day prior to the draw inspection site meeting a copy of the proposed payment request.
2. Provide copies of each Application for payment to the Architect and Owner at the draw inspection site meeting.
3. Submit signed electronic copy of the application to the Architect after the draw inspection site meeting. The application shall include additional documents listed above. Allow five calendar days for processing.
4. When Architect and Owner find the Application complete and acceptable, Architect certifies and submits to Owner for payment. If Architect finds application improperly or incorrectly executed an annotated copy is returned to the Contractor for a new submittal.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

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

C. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

D. Authority of Architect to assess defects and identify payment adjustments is final.

E. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from transporting vehicle.
   4. Products placed beyond lines and levels of required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

A. Authority: Measurement methods are delineated in individual specification sections.

B. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.

C. Take measurements and compute quantities. Architect will verify measurements and quantities.

D. Unit Quantities: Quantities and measurements indicated in Bid Form are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment.
   1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit sum/prices contracted.
   2. When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.

E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.

F. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

G. Unit Price Schedule: Contractor to provide unit prices for the following items.
   1. Price for removal and proper disposal of 10 cubic yards of contaminated soil.

1.7 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work. Coordinate related requirements specified in other parts of the Project Manual.

C. Referenced Specification sections stipulate pertinent requirements for products and methods to achieve the work specified under each Alternate Bid.

D. Contractor to state in bid form the amount added to, or deducted from, the Base Contract for all alternates (as applicable). Include necessary adjustment to costs in work of all trades.

E. Contractor to provide dates relative to other activities for when decisions are required for the list of Alternates.

F. Schedule of Alternates:

1. Alternate No. 1: Plastic Laminate Countertops in Residential Units
   a. Base bid: Solid surface countertops in all residential kitchens and bathrooms per 06 61 16.
   b. Additive Alternate: Replace solid surface countertops with Plastic Laminate Countertops per 06 61 00.
2. Alternate No. 2: Fruitvale Avenue Fence
   a. Base bid: chain link fence on Fruitvale Avenue as shown in drawings and per 32 31 16.
   b. Deductive Alternate: Delete fence on Fruitvale Avenue.
3. Alternate No. 3: Motorized Gates on Fruitvale Avenue.
   a. Base bid: motorized traffic gates on Fruitvale Avenue as shown in drawings and per 32 31 16.
   b. Deductive Alternate: Delete motorized gate, access control for gate and power for motorized gates.
4. Alternate No. 4: Off Site Parking.
   a. Base bid: pave, stripe and number southeast parking lot as shown on drawings.
   b. Deductive Alternate: Delete paving, striping and number of southeast parking lot.
5. Alternate No. 5: Bullet Resistant Glass.
   a. Base bid: Bullet resistant glass in windows and relites as shown in drawings and per 08 80 00.
   b. Deductive Alternate: Replace bullet resistant glass with tempered safety glass.
6. Alternate No. 6: Mirror Glass.
   a. Base bid: Mirrored glass in windows as shown in drawings and per 08 80 00.
   b. Deductive Alternate Replace mirrored glass with transparent tempered safety glass.
7. Alternate No. 7: Appliance Purchase.
   a. Base bid: appliances purchased by contractor per spec section 11 31 00.
   b. Deductive Alternate: Unit and common room refrigerators, ranges and range hoods purchased by owner.
8. Alternate No. 8: Appliance Install.
   a. Base bid: appliances installed by contractor per spec section 11 31 00.

b. Deductive Alternate: Unit and common room refrigerators and ranges installed by owner. Note range hoods installed by contractor.

9. Alternate No. 9: Commissioning.
   a. Base bid: Commissioning per Washington State Energy Code by general contractor.
   b. Deductive Alternate: Commissioning by third party commissioning agent hired by owner.

1.8 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Overhead and Profit:
   1. The Contractor is entitled to a maximum of 5.75% combined overhead and profit for all Change Order work performed by the General Contractor. Overhead is considered to be all costs attributed to the change with the exception of direct labor, material costs and equipment rental.
   2. The Contractor is entitled to a maximum of 5.995% combined overhead and profit for all Change Order work performed by subcontractors including lower tier subcontractors. Subcontractors are entitled to a maximum of 8% overhead and 7% profit for all Change Order work performed by themselves, and are entitled to a maximum 7% combined overhead and profit for all Change Order work performed by lower tier subcontractors.
   3. On Work deleted from the Contract, credit to the Owner shall be the Architect approved net cost (including direct labor costs including foremen, direct costs of materials and equipment to be entered into or omitted from the work, ownership or rental costs of any equipment during the time of use for the period of the change, insurance, social security, old age and unemployment contributions, industrial insurance, direct contributions to labor as fringe benefits) plus overhead and profit percentage noted above.

C. The Architect will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.

D. Construction Change Directive: Architect may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

E. The Architect may issue a Work Changes Proposal Request, on AIA form G709. The request should include a detailed description of proposed change with supplementary or revised Drawings and specifications. Contractor will prepare and submit estimate within 14 days. The estimate should also include any

required changes in Contract Time and the period of time during which the requested price will be considered valid.

F. Contractor Estimate: Contractor is to provide documentation to support any change in contract sum or contract time, including:
   1. Labor required.
   2. Equipment required.
   3. Products required.
   4. Recommended source of purchase and unit cost.
   5. Quantities required.
   6. Taxes, insurance, and bonds.
   7. Documented credit for work deleted from contract.
   8. Overhead and profit.
   9. Justification for any change in contract time.

G. Documentation for Time and Material/Force Account Change Order:
   1. Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract.
   2. Architect will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
   3. Contractor to support each claim with:
      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.

H. Construction Authorization:
   1. Recommendation of Proposal Request and/or acceptance of Contractor Estimate indicated by Architect's signature and corresponding date.
   2. After recommending the approval of the change proposal, the Architect forwards the change proposal to the Owner.
   3. The Owner upon accepting the change proposal will authorize the performance or the changes specified. The signed contract change proposal constitutes authority to proceed with the changed work. A formal change order in the amount of the work will follow. Billings for the changed work cannot be honored until the issuance of the formal change order.
   4. Owner's representative's acceptance signature and corresponding date are required for Contractor to proceed with a change of subsequent inclusion in change order.
   5. If either the Architect or Owner disapproves proposal, he will also state reason for disapproval, indicating if a revised proposal is requested or if the proposal is to be canceled, by separate correspondence.

I. Change Order Forms: AIA G701.

J. Preparation of Change Orders:
   1. Contractor will prepare Change Orders.
   2. Change Order lists and describes previously approved change proposals with additions and deletions, and attachments of revised contract documents to define change details.

3. Change order provides accounting of any contract sum and contract time adjustment with back up from subcontractor detailing material and labor costs.
4. Stipulated Sum Change Order: Based on proposal request and Contractor's fixed maximum price quotation.
5. Unit Price Change Order:
    a. For predetermined unit prices and quantities, the change order will be executed on a fixed unit price basis.
    b. For unit costs or quantities of units in work, which are not predetermined, execute work under a Contractor change directive.
    c. Changes in contract sum or contract time will be computed as specified for time and material/force account Change Order.
6. Time and Material/Force Account Change Order:
    a. Submit itemized account and support data after completion of change, within time limits indicated in the conditions of the contract.
    b. Architect will determine the change allowable in contract sum and contract time as provided in the contract documents.
    c. Maintain detailed records of work done on time and material/force account basis.
    d. Provide full information required for evaluation of proposed changes, and substantive costs for changes in the work.

K. Execution of Change Orders:
1. Contractor will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
2. Content of change orders will be based on completion of change proposal forms and field directives including Owner's approval.
3. Change Orders will be prepared monthly prior to progress payment submittal or at such intervals as the Architect deems most practical.
4. Change Orders will be prepared and signed and forwarded to the Owner.
5. Upon preparation, the change order will be provided to the Contractor for agreement and signature, and forwarded to the Architect who, following recommendations, forwards to the Owner's representative for final approval.
6. Upon signature and acceptance by the Owner, the Change Order becomes part of the contract documents, and alters the contract time and cost as needed. Electronic copies with scanned or digital signatures are returned to the Contractor and Architect via email.

L. Correlation Of Contractor Submittals:
1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
3. Promptly enter changes in Project Record Documents.
4. Products determined as unacceptable before or after placement.
5. Products not completely unloaded from transporting vehicle.
6. Products placed beyond lines and levels of required Work.

7. Products remaining on hand after completion of the Work.
8. Loading, hauling, and disposing of rejected products.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Field engineering.

C. Preconstruction meeting.

D. Progress meetings.

E. Pre-installation meetings.

F. Cutting and patching.

G. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

C. Follow routing shown 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. Notify architect of any conflicts between the work of different trades.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

F. 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.

1.3 FIELD ENGINEERING

A. Employ Land Surveyor registered in State of Washington, and acceptable to Architect/Owner.

B. Locate and protect survey control and reference points. Promptly notify Architect/Engineer of discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

G. Maintain complete and accurate log of control and survey work as Work progresses.

H. On completion of foundation walls and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

J. Promptly report to Architect loss or destruction of reference point or relocation required because of changes in grades or other reasons.

K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

1.4 PRECONSTRUCTION MEETING

A. Architect will schedule meeting after issuance of Notice to Proceed.

B. Attendance Required: Owner, Architect, and Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement (unless completed prior to meeting).
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. Designation of personnel representing parties in Contract, and Architect/Engineers.
6. Contractor’s use of the premises.
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 Geotechnical Engineer (if appropriate for this project).
10. Record documents.
11. Construction facilities, controls, and construction aids.
12. Temporary utilities.
13. Security procedures.
14. Other as needed.

D. Architect will record minutes and distribute copies within four days after meeting to participants, and those affected by decisions made.

1.5 PROGRESS MEETINGS

A. Scheduled regular weekly meetings will be arranged. At certain times meetings may be less frequent, as required and agreed.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Contractor's Job superintendent and Project Manager, Owner's Representatives, Architect, and others as appropriate to agenda topics.
   1. Attendance will typically be via telephone or video conference.
   2. Architect, Contractor, Owner shall attend in person on the construction site at pay application meetings.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems impeding planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to Work.

E. Architect will record minutes and distribute copies within four days after meeting to participants, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETINGS

A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.

B. Require attendance of parties directly affecting, or affected by, Work of specific section.

C. Notify Architect seven days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of installation, preparation and installation procedures.
   2. Review coordination with related work.

E. Contractor will record minutes and distribute copies within four days after meeting to participants, and those affected by decisions made.

PART 2 PRODUCTS (not applicable)

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ original installer to perform cutting and patching.

B. Execute cutting, fitting, and patching, including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.

5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
7. For additional requirements for cutting, excavating, and backfilling, see respective specifications sections.

C. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

D. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

E. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of penetrated element.

G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

H. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.

I. Where change of plane of ¼ inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review

J. Trim existing doors to clear new floor finish. Refinish trim to specified condition.

K. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Format.

C. Schedules.

D. Submittals.

E. Review and evaluation.

F. Updating schedules.

G. Distribution.

1.2 REFERENCES

A. The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry, Washington, D.C., The Associated General Contractors of America (AGC).

1.3 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel specializing in CPM scheduling with two years minimum experience in scheduling construction work of complexity comparable to this Project, and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: two years minimum experience in using and monitoring CPM schedules on comparable projects.

1.4 FORMAT

A. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with applicable specification section number.

B. Electronic Format: the schedule shall be delivered in electronic format via e-mail. Acceptable formats include Microsoft Project or Adobe Acrobat File.

1. At owners request a hard copy on 24 inch high x 36 inch wide format shall be delivered.

1.5 SCHEDULES

A. Prepare network analysis diagrams and supporting mathematical analyses using Critical Path Method, under concepts and methods outlined in AGC's "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

B. Illustrate order and interdependence of activities and sequence of work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.

C. Illustrate complete sequence of construction by activity, identifying work of separate stages. Indicate dates for submittals, including dates for Owner furnished items, and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.

D. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers.
2. Activity description.
3. Estimated duration of activity.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free float; accrue float time to Owner and to Owner's benefit.
11. Monetary value of activity, keyed to Schedule of Values.
12. Percentage of activity completed.
13. Responsibility.

E. Analysis Program: Capable of accepting revised completion dates, and re-computation of scheduled dates and float.

F. Required Sorts: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By longest float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by Schedule of Values listings.
7. Listing of basic input data generating report.
8. Listing of activities on critical path.

G. Coordinate contents with schedule of values in Section 01 33 00 - Submittal Procedures.

1.6 SUBMITTALS

A. Within ten days after date established in Notice to Proceed, submit proposed preliminary network diagram defining planned operations for first 60 days of Work, with general outline for remainder of Work.

B. Participate in review of preliminary and complete network diagrams jointly with Architect/Owner.

C. Within twenty days after joint review of proposed preliminary network diagram, submit draft of proposed complete network diagram for review. Include written certification that mechanical and electrical Subcontractors have reviewed and accepted proposed schedule.

D. Submit updated network schedules every pay application, or as requested by Architect/Owner.

E. Submit number of opaque reproductions Contractor requires, plus two, one each for Architect/Owner.

F. Submit under transmittal letter form specified in Section 01 33 00 - Submittal Procedures.

1.7 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of network diagrams and analysis with Architect/Owner at each submittal.

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

C. After review, revise network diagrams and analysis incorporating results of review, and resubmit within seven days.

1.8 UPDATING SCHEDULES

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. Update diagrams to graphically depict current status of Work.

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

D. Indicate changes required to maintain Date of Total Completion.

E. Submit sorts required to support recommended changes.

F. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect, including effects of changes on schedules of separate contractors.

1.9 DISTRIBUTION

A. Following joint review, 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 shown in schedules.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.
B. Construction progress schedules.
C. Schedule of values.
D. Product data.
E. Shop drawings.
F. Samples.
G. Design data.
H. Test reports.
I. Certificates.
J. Manufacturer's instructions.
K. Manufacturer's field reports.
L. Erection drawings.
M. Architect’s action.
N. Architect’s responsibilities.

1.2 SUBMITTAL PROCEDURES

A. Coordinate, prepare, submit, and distribute returned material, all submittals as required in other sections of this Project Manual.

B. Instructions to the General Contractor: All instructions will be given by the Architect or its authorized agents. No other instructions shall be recognized. Instructions from Architect will be made to General Contractor or its authorized agent (job superintendent) for distribution to subcontractors or trades people on the job. Subcontractors and material suppliers shall not contact Owner or Architect to discuss job.

C. Transmit each submittal with AIA Form G810, or Architect approved form.

D. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix. Alternate numbering system may, at Architect’s option, be utilized.

E. Identify Project, Contractor, subcontractor and supplier, pertinent drawing and detail number, and specification section number, appropriate to submittal.

F. 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 requirements of the Work and Contract Documents.

G. ESDS Submittal Requirements: See specification section 01 81 13 – 1.6.

H. MSDS Sheets will not be reviewed to evaluate worker safety requirements or procedures. DO NOT INCLUDE MSDS SHEETS unless they are the only location where VOC content is documented.

I. VOC Content: Include data for Volatile Organic Compound content for all sealants and adhesives for every product submitted. VOC content should be noted in grams per liter. Highlight VOC content in submittal.

J. Digital Submittal: Digital copies are preferred, and one digital submittal is sufficient.

K. Hard Copy Submittal: If a hard copy is submitted, deliver to Architect the number of sets required by Contractor(s), plus two to be retained by Architect and Architect's consultant.

L. Schedule submittals to expedite Project, and deliver to Architect's office. Coordinate submission of related items.

M. Allow 15 calendar days, excluding delivery time to and from Contractor, for each submittal for review.
   1. Allow 22 calendar days for specific submittals:
      a. Door Hardware.
      b. Low Voltage systems.
      c. Mechanical systems.
      d. Plumbing.
      e. Electrical.

N. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

O. Allow space on submittals for Contractor and Architect/Engineer review stamps.

P. When revised for resubmission, identify changes made since previous submission.

Q. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

R. Submittals not requested will not be recognized or processed.

S. A system of distributing submittals via electronic mail in an adobe acrobat format is acceptable only if agreed to by the Owner, Architect and Contractor.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with Section 01 32 16.

1.4 SCHEDULE OF VALUES

A. Comply with Section 01 20 00

1.5 PRODUCT DATA

A. Product Data: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

1. Submittals where product model has not been identified may be returned without review.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances to demonstrate conformance with design intent.

D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances to demonstrate conformance with design intent.

C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
1. Include signed and sealed calculations to support design.
2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 SAMPLES

A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Samples For Selection as Specified in Product Sections:
1. Submit to Architect for aesthetic, color, or finish selection.
2. Submit samples of finishes from full range of manufacturers' standard colors (or as specified in other sections) textures, and patterns for Architect selection.

C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Include identification on each sample, with full Project information.

E. Reviewed samples that may be used in the Work are indicated in individual specification sections.

F. Samples will not be used for testing purposes unless specifically stated in specification section.

G. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 DESIGN DATA

A. Submit for Architect's knowledge as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

A. Submit for Architect's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for Architect's benefit as contract administrator or for Owner.

B. Submit report to Architect, in duplicate, within seven calendar days of observation.

C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for Architect's benefit as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.14 ARCHITECT'S ACTION

A. After review, Architect will stamp the submittal and release with the following marks:
   1. "No Exceptions Taken" - Final Release, Unrestricted. No further submittal required.
   2. "Make Corrections Noted" - Final Release, restricted only by an exception or correction which is noted. Contractor need not resubmit unless further action or consideration is required regarding the excepted items.
   3. "Revise and Resubmit" - No fabrication, installation or related activity should be undertaken until revised submittal has been submitted and released. Resubmit as soon as possible to avoid delay. Repeat and revise as necessary to obtain release. If any additional element is modified in the shop drawing or submittal, identify clearly in the resubmitted documents.
   4. "Rejected - See Remarks" - No activity related to submittal may take place. Review remarks and if necessary discuss with architect. Resubmit.

1.15 ARCHITECT'S RESPONSIBILITIES

A. Checking is only for general conformance with the design concept of the project and general compliance with the Contract Documents. Any action shown is subject to the requirements of the Plans and Specifications.

B. Contractor is responsible for: review of dimensions and notifying architect in event of a discrepancy, fabrication processes and techniques of construction, coordination of work with all trades and the satisfactory performance of its work.

C. Review of separate items does not constitute review of assembly in which it functions. Acceptance of variations does not constitute a Change Order and Contractor remains responsible for full compliance with Contract Documents.

D. In the event that submittals are received by the Architect without the requisite contractor's review stamp, complete with signature and date, the Architect will promptly return the submittal to the Contractor with no action taken. The time taken for the Architect to administer such an event will not reduce the amount of time afforded the Architect to adequately review the submittal.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances.

C. References.

D. Mock-up requirements.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

1.2 QUALITY CONTROL AND 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 the installation sequence.

C. When 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. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements as indicated on Shop Drawings or as instructed by manufacturer.

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

1.3 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. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

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

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue of Contract Documents, or date of Owner-Contractor Agreement when there are no Bids, except where specific date is established by code.

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

D. When specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.

1. Window water resistance tests will be performed per specification section 08 53 00.

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

C. Accepted mock-ups shall be comparison standard for remaining Work.

D. Mock up shall include, at a minimum:

1. All products of the assembly (framing and sheathing, windows, insulation products, flashing and weather barriers).
2. One residential window assembly in each type of exterior siding (Fiber Cement Siding.)
3. Through wall flashing.

E. Tests will be performed under provisions identified in this section and identified in respective product specification sections. See section 08 53 00 – 3.3.

F. Location: The mock up will match an eight foot long and one story high section of the exterior. The mock up will incorporate one vinyl window opening and one siding transition.

1.6 TESTING AND INSPECTION SERVICES

A. Owner will engage and pay for specified services of a qualified independent firm to perform structural field testing and inspection.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Authority having jurisdiction.

1. Laboratory: Authorized to operate in State of Washington.

2. Laboratory Staff: Maintain full time specialist on staff to review services.
3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.

D. Reports will be submitted by independent firm to Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Architect/Engineer and independent firm 24-hours prior to expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

H. Agency Responsibilities:

1. Test samples of mixes submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
6. Perform additional tests required by Architect/Engineer.
7. Attend preconstruction meetings and progress meetings.

I. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer and to Contractor. When requested by Architect/Engineer, provide interpretation of test results. Include the following:

1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.

6. Location in Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

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

1.7 AIR BARRIER TESTING

A. Contractor will engage and pay for the services of a qualified independent firm to perform air barrier field testing.
1. Testing will meet requirements of Washington State Energy Code Air Barrier Building Test per C402.5.

B. The independent firm will perform tests as required by Authority having jurisdiction.
1. Testing Service: Authorized to operate in State of Washington.
2. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Reports will be submitted by independent firm to Architect/Engineer and Contractor indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. Cooperate with independent firm; furnish assistance by incidental labor as requested.

E. See specification section 07 27 00 and drawings for air barrier requirements.

1.8 COMISSIONING

A. Contractor will engage and pay for the services of a qualified firm to observe and record the results of commissioning tests.
1. Commissioning will meet requirements of Washington State Energy Code per C408.
2. Commissioning will meet the additional requirements for ESDS Criteria 4.01a and 4.01b. See specification section 01 81 13.

1.9 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. 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.

D. Refer to Section 01 33 00 - Submittal Procedures and MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify 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. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 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 new material or substance in contact or bond.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Abbreviations/Acronyms of Associations and Standards.

AASHTO	American Association of State Highway & Transportation Officials
ACI	American Concrete Institute Box 19150, Redford Station Detroit, MI 48219
AIA	American Institute of Architects 1735 New York Avenue NW Washington, DC 20006
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1016 Street NW Washington, DC 20036
AITC	American Institute of Timber Construction 333 West Hampden Avenue Englewood, CO 80110
ANSI	American National Standards Institute (formerly ASA, the USASI) 1430 Broadway New York, NY 10018
APA	American Plywood Association 1119 "A" Street Tacoma, WA 98401
ASA	American Subcontractor's Association 815 — 15th Street NW Washington, DC 20005
ASHRAE	American Society of Heating, Refrigeration, & Air-Conditioning Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing & Materials 1916 Race Street Philadelphia, PA 19103

AWPA	American Wood Preservers Association 1625 Eye Street NW Washington, DC 20006
CISCA	Ceilings and Interior Systems Contractors Association 1201 Waukegan Road Glenview, IL 60025
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street Chicago, IL 60601
CS	Commercial Standard of US Department of Commerce Washington, DC 20036
DFPA	Douglas Fire Plywood Association - See APA (now known as American Plywood Association)
EPD	Environmental Product Declaration Type III environmental declarations as described in ISO 14025:2006.
ESDS	Evergreen Sustainable Development Standard State of Washington Department of Commerce
ISO	International Organization for Standards Chemin de Blandonnet 8 CP 401-1214 Vernier, Geneva, Switzerland
IEEE	Institute of Electrical & Electronic Engineers, Inc. 345 East 47th Street New York, NY 10017
I-SANTA	Industrial Stapling and Nailing Technical Association P.O. Box 3072 City of Industry, CA 91744
NAAMM	National Association of Architectural Metal Manufacturers 1033 South Boulevard Oak Park, IL 60302
NFPA	National Fire Protection Association 407 Atlantic Avenue Boston, MA 02210
NFRC	National Fenestration Rating Council 6305 Ivy Lane, Suite 140 Greenbelt, MD 20770
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018
NWMA	National Woodwork Manufacturer's Association, Inc.

400 West Madison Avenue
Chicago, IL 60606

PCA	Portland Cement Association Old Orchard Road Skokie, IL 60076
SSPC	Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213
IBC (ICBO)	Uniform Building Code of International Conference of Building Officials 5360 South Workman Hill Road Whittier, CA 90601
YHA	Yakima Housing Authority 810 North 6th Avenue Yakima, WA 98902
UL	Underwriters Laboratories 1410 SW Morrison Street Portland, OR 97205
WCLB	West Coast Lumber Inspection Bureau

B. Names and addresses of other organizations appearing in the technical sections where their products are specified may be listed in Sweet's Architectural File, or CSI-MN-7, Sources of Construction Information, latest edition.

C. References herein to specifications issued by above-named, or other organizations, mean editions current at the date of the contract, unless a specific date is referenced otherwise in this manual.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary lighting for construction purposes.
   3. Temporary heating.
   4. Temporary ventilation.
   5. Telephone service.
   6. Facsimile service.
   7. Temporary water service.
   8. Temporary sanitary facilities.
   9. Temporary enclosures.

B. Construction Facilities:
   1. Construction aids.
   2. Field offices and sheds.
   3. Vehicular access.
   4. Parking.
   5. Progress cleaning and waste removal.
   6. Project identification sign.
   7. Traffic regulation.
   8. Fire prevention facilities.

C. Temporary Controls:
   1. Barriers.
   2. Security.
   3. Water control.
   4. Dust control.
   5. Erosion and sediment control.
   6. Noise control.
   7. Pollution control.
   8. Rodent control.

D. Removal of utilities, facilities, and controls.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with federal, state, city, and all local codes and regulations.

1.3 TEMPORARY ELECTRICITY

A. Provide and pay for power service required for construction operation.

B. Complement existing power service capacity, if any, and characteristics as required for construction operations.

C. Provide distribution equipment, wiring, outlets, and branch circuits for power and lighting—as required by governing codes and as required for construction operations.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain lighting to interior work areas after dark for security purposes.

1.5 TEMPORARY HEATING

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify 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.

C. Do not use permanent electric space heaters for temporary heat during construction. After installation, install dust-tight covering to avoid construction dust build-up on heating and ventilation equipment. Cleaning of ducts and equipment due to use during construction will be the responsibility of the Contractor.

1.6 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.7 TELEPHONE SERVICE

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

1.8 DATA SERVICE

A. Provide, maintain and pay for data service and dedicated data line to field office at time of project mobilization.

1.9 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

1.10 TEMPORARY SANITARY FACILITIES

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

1.11 TEMPORARY ENCLOSURES

A. Provide temporary weather tight enclosures of exterior walls for successive areas of the building as work progresses to assure:

1. Acceptable working conditions.
2. Weather protection for interior materials.
3. Effective temporary heating
4. Prevention of entry/unauthorized persons and the like. Provide temporary exterior doors with padlocks.

1.12 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel to facilitate execution of work. Include scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, protective enclosures, and other such facilities and equipment. Refer to respective sections for particular requirements for each trade.

B. As applicable, when permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.

C. Maintain all facilities and equipment in a first class condition.

1.13 FIELD OFFICES AND SHEDS

A. Provide Field Office: Weather tight, with lighting, electrical outlets, and heating equipment.
   1. At owner's option contractor may use existing buildings on site for the field office.

B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

C. When permanent facilities are enclosed with operable utilities, relocate offices and storage into building, with written agreement of Owner, and remove temporary buildings.

D. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.
   1. If existing building is used, remove all furnishings and equipment and restore all finishes to new condition.

1.14 VEHICULAR ACCESS

A. Construct temporary all-weather access from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
   1. Comply with Civil Engineer's TESC plan. If

B. Extend and relocate vehicular access, as Work progress requires, provide detours as necessary for unimpeded traffic flow.

C. Provide unimpeded access for emergency vehicles.

D. Provide and maintain access to fire hydrants and control valves free of obstructions.

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

1.15 PARKING

A. Provide temporary surface parking areas to accommodate construction personnel. Do not allow personnel to park in YHA owned parking lots.

B. When site space is not adequate, provide additional off-site parking as required.

1.16 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in 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 spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

1.17 PROJECT IDENTIFICATION SIGN

A. Provide and install a project identification sign on the subject property. Design as provided by Architect.

B. Project Identification Sign:
   1. One sign, 4’ x 8’.
   2. Content:
      a. Project title, logo, and name of Owner and funders.
      b. Names and titles of Architect, Contractor and Consultants.
      c. Name of Prime Contractor.
      d. Color rendering of project.
   3. Graphic Design, Colors, Style of Lettering: as designated by Architect.

C. Sign Fabricator/Painter: Experienced as professional sign painter for minimum three years.

D. Finishes/Painting: Adequate to withstand weathering, fading, and chipping for duration of construction. Lettering: Pre-cut vinyl self-adhesive products are acceptable.

E. Sign Surfaces: Exterior plywood with medium density overlay, standard large size to eliminate joints; thickness as required by standards to span across framing members and to provide an even, smooth surface without waves or buckles – 3/4” minimum.

F. Installation:
   1. Install project identification sign within 21 days after date fixed by Notice to Proceed.
   2. Erect at location designated by Owner.
   3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
   4. Install sign surface plumb and level, with butt joints. Anchor securely with galvanized hardware.
   5. Paint exposed surfaces of sign, supports, and framing.

G. Maintenance: Maintain signs and supports in clean condition; repair damages.

H. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.18 TRAFFIC REGULATION

A. Traffic Control Plan
   1. Submit traffic control plan to Authority Having Jurisdiction for approval prior to start of construction.

B. Signs, Signals, And Devices:
   1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As required and approved by authority having jurisdiction.
   2. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
   3. Flag person Equipment: As required by authority having jurisdiction.

C. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

D. Haul Routes:
   1. Develop plan, and obtain approval, from authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

E. Removal:
   1. Remove equipment and devices when no longer required.
   2. Repair damage caused by installation.

1.19 FIRE PREVENTION FACILITIES

A. Conform to all laws governing construction personnel smoking.

B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Standpipes: Install minimum one standpipe for use during construction as required by governing authorities.

D. Develop and supervise a comprehensive fire prevention and fire protection program. Instruct personnel in the methods and procedures of the program. Post warnings and information and enforce strict discipline. Review needs with local fire department and establish procedures to be followed. Maintain unobstructed access to extinguishers, hydrants, stairways, and other escape routes and access routes for firefighting. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

E. Provide one fire extinguisher at each stair on each floor of buildings under construction and/or demolition.

F. Provide minimum one fire extinguisher in every construction trailer and storage shed.

G. Provide minimum one fire extinguisher on roof during roofing operations using heat-producing equipment.

1.20 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.

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

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

1.21 SECURITY

A. Security Program:
   1. Protect Work, and existing premises from theft, vandalism, and unauthorized entry.
   2. Initiate program at project mobilization.
      a. Program to consist of, at minimum, temporary enclosures per 1.12 and barriers per 1.21.
      b. Provide additional security measures if necessary.
      c. Additional security may include security guards and / or electronic security devices such as motion detectors, alarms and cameras.
   3. Maintain program throughout construction period until Owner occupancy.

B. Entry Control:
   1. Restrict entrance of persons and vehicles into Project site and existing facilities.
   2. Allow entrance only to authorized persons with proper identification.
   3. Maintain log of workers and visitors, make available to Owner on request.

1.22 WATER CONTROL

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.

1.23 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.24 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.25 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise from, and noise produced by, construction operations.

1.26 POLLUTION CONTROL

A. 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.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

C. Comply with Phase Two Environmental Assessment produced by Fulcrum Environmental Consulting.

1.27 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.28 TREE PROTECTION

A. Not applicable this project.

1.29 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.

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

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

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 50 05

CONSTRUCTION WASTE MANAGEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for construction waste management, including temporary facilities, waste handling and administrative procedures.

1.2 RELATED SECTIONS

A. Section 01 10 00 - Summary of Work.

B. Section 01 33 00 - Submittal Procedures.

C. Section 01 81 13 - Sustainable Design Requirements.

D. Divisions 2-33: individual sections contain specifics relating to Construction Waste Management.

1.3 REFERENCES

A. Evergreen Sustainable Development Standard, criteria 6-3.

B. Washington State Department of Ecology, for list of recycling centers and waste recyclers.

C. The “Recycling Plus Program Manual” published by the Washington State Clean Washington Center can be used to develop a job site reduction program. The manual includes a job-site recycling worksheet and form, tips on waste reduction, and other technical assistance. The manual also includes sample language for waste reduction requirements for subcontractors’ agreements, as well as sample provisions for a full-service recycling agreement.

1.4 REQUIREMENTS

A. Landfill Diversion: Owner has set the following waste reduction goals for the project, within the limits of the construction schedule, contract sum, and available materials, equipment, products and services.

1. Divert at least 75% of construction waste from landfill.
2. Materials contaminated with hazardous substances are not to be recycled, and will not be counted towards the total mount of construction waste for the purpose of calculating the percentage of waste diverted. See specification section 02 81 00.
3. If co-mingled recycling services are used, the recycling service must be required to provide hauling receipts outlining what percentage of weight was diverted from landfill.

1.5 SUBMITTALS

A. Construction Waste Management Plan: Within thirty (30) days of the Notice to Proceed, or prior to waste removal, whichever occurs sooner, the Contractor shall prepare and submit a written and/or graphic Construction Waste

Management Plan to the Architect in accordance with Section 01 33 00 - Submittal Procedures. The Plan shall include the following:

1. Haulers: Name, address and phone number for each hauler providing service.
2. Facilities: Identification of each recycling facility to be utilized.
3. Separation and Protection: Description of the method to be employed in handling waste materials and description of the method that will be used to protect recycled materials from contamination.
4. Transportation: Description of the means of transportation of waste materials and the destination of the materials.
5. Subcontractor Participation: A description of requirements for subcontractors to adhere to that includes waste prevention measures such as salvage for resale or reuse and recycling for the waste materials generated by each subcontractors scope of work, including packaging and shipping materials.

B. Approval by the Architect and the Owner of the Contractor's Construction Waste Management Plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures specified.

C. Issue a copy of the complete approved Construction Waste Management Plan to each Subcontractor before they commence work on the site. Confirm to the Architect in writing that each Subcontractor has received a copy of the approved Construction Waste Management Plan.

D. Waste Diversion Report: Submit a report with each pay application per Section 01 20 00. The Construction Waste Management Report shall be submitted on a form acceptable to the Owner and shall contain the following information:

1. The amount (in tons or cubic yard of material) and type of waste materials recycled. Provide the date removed from the jobsite, the location of the Receiving Facility, the amount of any money paid or received for the recycled or salvaged material, and the total disposal cost including transportation costs, container rental costs, taxes, etc. Include manifests, weight tickets receipts, and invoices.
2. Totals for date including: trash generated by weight and percentage of total; waste materials generated by weight and percentage of total identified by salvaged for resale, salvaged for reuse, or recycled; cost savings; and percentage of disposal fees saved.

E. ESDS Binder:

1. Include Waste Management Report showing compliance with Criterion 6.03. See specification section 01 83 13 – 1.6 C 13.

F. Final Report: Provide calculations on total construction waste recycling rates, salvage rates, and landfill rates. Submit concurrently with the final Application for Payment. Demonstrate compliance with performance requirement.

1.6 REVENUES

A. Revenues or other savings obtained from recycling, reused, or salvaged materials shall accrue to the Contractor.

PART 2 PRODUCTS

2.1 WASTE CONTAINERS

A. Durable, covered, secured, reusable container for each category or waste.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT IMPLEMENTATION

A. Implement and maintain, for the duration of the project, the construction waste management program including the following:
   1. Manager: The Contractor shall designate an on-site person (or persons) responsible for instructing workers and overseeing and documenting results of the Construction Waste Management Plan for the Project.
   2. Distribution: The Contractor shall distribute copies of the Construction Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.
   3. Instruction: The Contractor shall 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.
   4. Materials Handling Procedures: Protect materials to be recycled from contamination. Handle, store, and transport materials in a manner that meets the requirements of the designated facilities for acceptance.
   5. Hazardous Wastes: Separate, store, and dispose of hazardous waste according to local regulations and the recommendations of the Owner’s Special Consultant. See specification section 02 81 00.
   6. As part of regular clean-up schedule visual inspections of dumpsters and recycling bins to identify potential contamination of material.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

F. Permanent Labels.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Arrange deliveries of products in accord with construction schedule 01 32 16.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Bidders shall submit requests for Substitutions to requirements specified in this section a minimum of ten days prior to scheduled bid date.

B. After contract date, the Architect and Owner may, at their option, consider certain other substitutions submitted in accordance with requirements of this section.
   1. Substitutions submitted after the contract date should be accompanied with documentation of the following:
      a. Money credited to the owner.
      b. Time saving for the project.
      c. Superior performance compared to specified product.

C. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

D. A request constitutes a representation that Bidder or Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for Substitution as for specified product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.
   5. Will reimburse Owner for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:
   1. Submit electronic copy of request for Substitution for consideration. Limit each request to one proposed Substitution.
   2. Submit complete data substantiating compliance of proposed Substitution with Contract Documents. Burden of proof is on proposer.
   3. Architect/Engineer will notify Bidder or Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

2.1 PERMANENT LABELS

A. All service connected or power connected equipment shall bear a permanent nameplate which includes the following data and any other relevant operating information:
   1. Manufacturer.
   2. Product name, model, serial number.
   3. Capacity, speed, ratings, power requirements etc.

PART 3 EXECUTION

Not Used.

END OF SECTION

SUBSTITUTION REQUEST FORM

PROJECT NAME: Fruitvale Apartments

To ARCHITECT: SMR Architects
tquinn@smrarchitects.com

From CONTRACTOR: _____
(Contact Company & Person)

Specified product:
Section Paragraph Specified Item

_____

Proposed substitution:
Section Paragraph Specified Item

_____

Attachments: PROVIDE ALL OF THE FOLLOWING (If not applicable, write n/a in space provided at right of each number)

No. 1:____Complete product data/01 33 00.
No. 2:____Drawings showing dimensional changes and other changes to drawings/01 33 00.
No. 3:____Complete description of all installation changes.
No. 4:____Complete description of all changes to Drawings and Specifications.
No. 5:____Description of effect on other trades, other Contracts, and Contract completion date.
No. 6:____List of differences between proposed and specified items.
No. 7:____List of names and addresses of three similar projects on which product was used, date of installation, and Architect's name and address.
No. 8:____Cost impact: $_____ Add / Deduct

Undersigned attests function and quality equivalent or superior to specified item.

Submitted by: (Person and Firm) _____

Date_____Phone_____Signature_____

Action: Accepted Accepted as Noted Not Accepted

By:

Date:

Remarks:

END OF FORM

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout sequence.
B. Final project assessment.
C. Contractor’s closeout submittals.
D. Final cleaning.
E. Starting of systems.
F. Demonstration and instructions.
G. Testing, adjusting and balancing.
H. Protecting installed construction.
I. Project record documents.
J. Operation and maintenance data.
K. Manual for materials and finishes.
L. Manual for equipment and systems.
M. Spare parts and maintenance products.
N. Product warranties and product bonds.

1.2 CLOSEOUT SEQUENCE

A. Contractor submits Draft copies of Operations and Maintenance Data, Manual for Materials and Finishes and Manual for Equipment and Systems.
B. Contractor executes final cleaning per 1.3.
C. Contractor submits certification to Architect per 1.4.A.
D. Architect inspects the project per 1.4.B.
E. Architect will issue Certificate of Substantial Completion per 1.4.C
F. Contractor submits final copies of Project Record Documents, Operations and Maintenance Data, Manual for Materials and Finishes, Manual for Equipment and Systems, and Warranties and Bonds.
G. Contractor submits final submittals per 1.5.
H. Contractor submits final application for payment.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
B. 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.
C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Replace filters of operating equipment.

E. Clean all surfaces of electric wall heaters, inside and out.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep and hose wash paved areas, rake clean landscaped surfaces.

H. Do not use cleaning materials that create hazards to health or property.

I. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 FINAL PROJECT ASSESSMENT

A. The Contractor will submit written certification to the Architect that:
   1. Contract Documents have been reviewed.
   2. Work has been inspected, and that Work is complete in accordance with Contract Documents.
   3. Systems have been tested in the presence of Architect and Owner's representatives and are operational.
   4. Work is ready for final project inspection.

B. Upon receipt of certification, the Architect will (with reasonable promptness) inspect the project to verify completion status. Should the Architect consider that work is incomplete or defective:
   1. The Architect will promptly notify the Contractor in writing, listing incomplete or defective work.
   2. The Contractor will then take immediate steps to remedy stated deficiencies, and send second written certification to the Architect that the work is complete.
   3. The Architect will re-inspect the work.

C. When the Architect finds that the work is substantially complete the Architect will prepare the Certificate of Substantial Completion for acceptance by the Owner and Contractor. The Certificate:
   1. Indicates the Date of Substantial Completion.
   2. Includes a list of items to be completed or corrected.
   3. Provides for agreement as to the time allowed for completion or correction of the items.
   4. Indicates the date when the owner will occupy the work
   5. Describes the responsibilities for maintenance, heat, utilities and insurance between the Date of Substantial Completion and owner occupancy.

1.5 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Provide submittals to Architect required by authorities having jurisdiction. Submittals shall include Certificate of Occupancy.

B. Submit project record documents per 1.10.

C. Submit evidence of all warranties and bonds.

D. Submit evidence of payment and release of liens to requirement of conditions of the contract.

E. Submit a final statement of accounting identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1. Architect will prepare final change order reflecting approved adjustments to contract sum if not previously made by change orders.

1.6 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Owner seven days prior to start-up of each item.

C. Verify 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 equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of Contractors' personnel in accordance with manufacturers' instructions.

G. Submit a written report in accordance with Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.7 DEMONSTRATION AND INSTRUCTIONS

A. Schedule time for demonstration and instruction with owner.

B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. Required instruction time for each item of equipment and system is specified in individual sections.

1.8 TESTING, ADJUSTING AND BALANCING

A. Employ and pay for services of independent firm to perform testing, adjusting, and balancing of equipment, and to commission equipment as specified in Mechanical and Electrical Specifications.

B. Reports will be submitted by independent firm to Architect indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.9 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.10 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.

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, not less than weekly.

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: 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. Location, size and purpose of all access doors and hatches.
   6. Details not on original Contract drawings.

G. Submit Record Drawings within 10 days after date of Substantial Completion.
   1. Submit one full color digital copy of Record Drawings. Either Adobe Acrobat or Tagged Image File Format (TIFF) is acceptable.

1.11 ESDS DOCUMENTATION

A. Maintain on site one binder containing the Evergreen Project Plan and associated exhibits demonstrating compliance. See 01 81 13 for more information on sustainable requirements.

B. Exhibits should include, at a minimum:
   1. Documentation showing Erosion and Sedimentation control measures in place.
   2. Data showing plumbing fixture flow rates in gallons per minute.
   3. Data showing domestic water heating efficiency.
   4. VOC content for all paints and primers.
   5. VOC content for all sealants and adhesives.
   6. Certifications that carpet and adhesives comply with CRI Green Label Plus Standards.
   7. Data showing bathroom ventilation equipment.
   8. Submittal detailing hot and cold water piping insulation.
   9. Submittal detailing vapor barrier at concrete slab on grades.
   10. Addenda.
   11. Data showing compliance with waste management plan, and record of the amount of construction waste diverted from the landfill.
   12. Submittals necessary to show compliance with optional points in the Evergreen Project Plan.

C. Ensure entries are complete and accurate, enabling future reference by Owner.

D. Add submittal information concurrent with construction progress, not less than weekly.

E. Submit one original and one copy of the ESDS Project Plan with supporting documents in final form within 10 days after date of Substantial Completion.

1.12 OPERATION AND MAINTENANCE DATA

A. Submit one draft copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with comments. Revise content of document sets as required prior to final submission.

B. Submit one physical set and one electronic version of revised final volumes within 10 days after date of Substantial Completion.

C. Submit physical copy of data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable covers.

D. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

E. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

F. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

G. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Originals of warranties and bonds.

1.13 MANUAL FOR MATERIALS AND FINISHES

A. Submit one draft copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final assessment, with comments. Revise content of document sets as required prior to final submission.

B. Submit three sets of revised final volumes in final form within 10 days after date of Substantial Completion.

C. Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable covers.

D. Prepare binder cover with printed title "MANUAL FOR MATERIALS AND FINISHES", title of project, and subject matter of binder when multiple binders are required.

E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification sections.

I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.14 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy to be reviewed and returned after final inspection, with comments. Revise content of document sets as required prior to final submission.

B. Submit one physical set and one electronic copy of revised final volumes in final form within 10 days after date of Substantial Completion.

C. Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable covers.

D. Prepare binder cover with printed title "MANUAL FOR EQUIPEMENT AND SYSTEMS", title of project, and subject matter of binder when multiple binders are required.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

G. Include color coded wiring diagrams as installed.

H. 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 special operating instructions.

I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

J. Include servicing and lubrication schedule, and list of lubricants required.

K. Include manufacturer's printed operation and maintenance instructions.

L. Include sequence of operation by controls manufacturer.

M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

N. Include control diagrams by controls manufacturer as installed.

O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.

P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

R. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.

S. Additional Requirements: As specified in individual product specification sections.

T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.15 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.16 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed by responsible subcontractors, suppliers, and manufacturers, with starting date of warranty and bond periods commencing on the date established in paragraph G below.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Prepare binder cover with printed title "PRODUCT WARRANTIES AND PRODUCT BONDS", title of project, and subject matter of binder when multiple binders are required.

G. Submit one physical copy and one electronic copy within 10 days after date of Substantial Completion.

H. Time Of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance, listing date of acceptance by Owner as beginning of warranty or bond period.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 81 13

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General requirements and procedures for the Project to meet the requirements of the Evergreen Sustainable Development Standard (ESDS) Version 4.0.1.

B. Related Sections:
   1. Evergreen Project Plan.
   2. Section 01 10 00 - Summary of Work
   3. Section 01 33 00 - Submittal Procedures.
   4. Section 01 50 05 - Construction Waste Management.
   5. Divisions 1-33 for ESDS requirements specific to the Work of each of these sections.

1.2 PROGRAM DESCRIPTION

A. To be eligible for funding from the Washington State Housing Trust Fund (HTF), an applicant project must satisfy the requirements of the Evergreen Sustainable Development Standard (ESDS). This rating system sets a standard definition for green affordable housing and includes a checklist for evaluating projects. New construction projects must comply with the listed mandatory criteria and must also earn a minimum of fifty (50) additional points from the optional criteria. The Contractor is required to participate with the Architect and Owner in this effort. The specific criteria this Project is pursuing are highlighted in the Evergreen Checklist following this Section.

B. The program consists of eight (8) environmental categories. Points are awarded for achieving the requirements of each criterion and are added together to arrive at a total score for the building. The eight categories are as follows:
   1. Integrative Design
   2. Location and Neighborhood Fabric.
   3. Site Improvements.
   4. Water Conservation,
   5. Energy Efficiency.
   6. Materials Beneficial to the Environment.
   7. Healthy Living Environment.
   8. Operations and Maintenance.

C. Sustainable building requirements have been incorporated into the design, specifications and General Requirements of this project in support of the criteria available in the checklist.

1.3 DOCUMENTS

A. The Evergreen Project Binder:
   1. The “Evergreen Project Binder” will be an online document managed by the Architect. The Online document will be available for review by the

Owner, Contractor and the Third-Party Inspector for the Washington State HTF.

2. The Contractor shall provide the Architect with the information required for the ESDS Binder described in paragraph 1.6 D below. The information will be provided in an electronic format per the Architect's direction.

1.4 COMPLIANCE

A. There are a number of submittals required from the General Contractor and subcontractors to satisfy the program. Submittals are identified in appropriate Sections of this Manual. Refer to Section 01 33 00.

1.5 REFERENCES

A. Evergreen Sustainable Development Standard (ESDS) version 4.0.

B. Carpet and Rug Institute (CRI).

C. Forest Stewardship Council (FSC).

D. Green Seal 11.

E. South Coast Air Quality Management (SCAQMD) District, Rule 1168.

F. Bay Area Air Quality Management District (BAAQMD), Regulation 8, Rule 51.

G. UL GreenGuard Certification Program.

H. SCS Global Services Indoor Air Quality Certification.

1.6 SUBMITTALS

A. General: Comply with Section 01 33 00 "Submittal Procedures", this section and specific submittal requirements of Division 1-33. Refer to the Checklist attached to this specification section for a list of program points being pursued for the project. Specific action required of the Contractor is listed for each credit point.

B. ESDS Criteria Documentation provided by the Owner / Architect:
   1. Criteria 1.01a Integrative Process.
   2. Criteria 1.01b Integrative Design: Documentation.
   3. Criteria 1.03 Beyond ADA: Universal Design.
   4. Criteria 2.01 Appropriate Project Siting
   5. Criteria 2.02a Connections to Existing Development & Infrastructure
   6. Criteria 2.03a Compact Development
   7. Criteria 2.03b Higher Density Development
   8. Criteria 2.04a Access to Services
   9. Criteria 2.04b Enhanced Access to Services
   10. Criteria 2.05a Access to Transit
   11. Criteria 2.06b Preservation of and Access to Urban Open Space
   12. Criteria 2.07 Walkable Neighborhoods – Sidewalks and Pathways
   13. Criteria 2.08 Reducing Private Automobile Use
   14. Criteria 2.09 Greyfield, Brownfield, or Adaptive Reuse Site
   15. Criteria 2.12a Access to Broadband: Broadband Ready
   16. Criteria 3.01 Environmental Remediation.
   17. Criteria 3.02b Advanced Landscaping
   18. Criteria 3.02c Landscaping – Significant Trees
   19. Criteria 7.03 Integrated Pest Management. Submit a draft of the IPM.

20. Criterion 7.05a Smoke Free Units and Common Areas:
    a. Submit copy of lease agreement showing smoke free requirement.
21. Criterion 8.01b O&M Instructions for Maintenance Staff
22. Criterion 8.02 Resident / Owners Manual
23. Criterion 8.03 Walk-Through and Orientation for Residents

C. ESDS Criteria Documentation provided by Contractor. Contractor to Submit the following information to Architect in electronic format for inclusion in the Evergreen Binder:
1. Criterion 3.02 b Landscaping:
    a. Submit landscaping plant list from landscaping subcontractor.
    b. Provide photographs of all landscaped areas before and after landscaping is completed.
    c. See specification section 32 93 00 Plants.
2. Criterion 3.02 c Landscaping – Significant Trees
    a. Submit photographs of each Significant Tree. Each photograph must include a size reference to substantiate the size of the Significant Tree.
3. Criterion 3.03 Efficient Irrigation:
    a. Submit cut sheets showing that irrigation rotors, multi-stream rotors and spray heads have a documented average distribution uniformity (DU) of at least 7.0.
    b. Submit cut sheets showing that spray sprinklers are compliant with Water Sense Version 1.
    c. Submit cut sheet of programmable controller.
    d. Submit cut sheet of moisture controller.
    e. See specification section 32 84 00 Planting Irrigation.
4. Criterion 3.04 Storm Drain Labels:
    a. Submit photo of storm drain label that show the storm drain's location on site. See specification section 33 14 36 Parking Labels.
5. Criterion 4.01a Water-Conserving Fixtures:
    a. Submit product data for Toilets showing:
        1) 1.28 GPF or less
        2) Water sense label
        3) MaP testing
    b. Submit results from Showerhead and Faucet timed flow volume testing for 15% of units.
    c. Submit results from Toilet flush volume test for 15% of units.
    d. Submit cut sheet for any pressure reducing valves installed.
6. Criterion 4.01b Water-Conserving Fixtures:
    a. Submit product data for shower heads including water sense label and flow rate of 1.5 GPM or less.
    b. See specification section 22 40 00 Plumbing Fixtures for submittal requirements.
7. Criterion 4.06 Efficient Plumbing Layout & Design:
    a. Submit Information on the type and diameter of pipe used for hot water supply.
    b. Submit photo documentation of hot water supply lines.
8. Criterion 5.03 Energy Star Appliances:

a. Submit product data for all residential scale dish washers and refrigerators in units or in common spaces showing Energy Star label.
b. See specification section 11 31 00 Appliances.

9. Criterion 5.04 Central Laundry:
   a. Submit product data for washers and dryers showing Energy Star labels.
   b. See specification section 11 31 00 Appliances.
10. Criterion 5.07a Photovoltaic Ready
   a. Submit cut sheet for conduit for future PV installed.
   b. Submit photographs of installed conduit installation prior to cover.
11. Criterion 5.08: Domestic Water Heating.
   a. Submit cut sheets for water heaters with data proving the heaters are WSEC compliant.
12. Criterion 6.01a Healthier Material Selection:
   a. Submit product data for all paints and primers used on the interior of the building showing that products are certified UL GreenGuard Gold or SCS Indoor Advantage Gold. See specification section 09 91 23.
   b. Submit product data for adhesives and sealants used on the interior of the building indicating VOC content in gallons per liter (g/L). See specification section 07 90 00 Sealants.
   c. Submit product data for resilient floor showing all products have FloorScore certification. See specification section 09 65 19.
   d. Submit product data for carpet and pad showing all products have CRI-Green Label Plus certification. See specification section 09 68 00.
   e. Submit product data for cavity insulation including batt insulation, acoustic insulation and spray foam insulation showing all products are certified UL GreenGuard Gold or SCS Indoor Advantage Gold. See specification section 07 21 16 and 07 21 15.
   f. Submit product data for all composite wood showing all products have formaldehyde emissions less than or equal to the thresholds provided by CARB Phase 2. Exceptions to this requirement are exterior grade wood structural panels and structural wood products.
13. Criterion 6.03 Construction Waste Management:
   a. Submit job site waste management plan. See Section 01 50 05.
   b. Submit records from waste disposal site documenting diversion of construction waste from the landfill.
14. Criterion 7.01 Combustion Equipment:
   a. Submit cut sheets for water heaters showing they do not use fossil fuel.
15. Criterion 7.03 Integrated Pest Management:
   a. Submit photos of installed screens on openings greater than ¼ inch.
   b. Submit cut sheets of exterior caulking or sealants.
16. Criterion 7.04 Lead Safe Work Practice:
   a. Submit documentation that demolition contractor is Renovation, Repair and Painting certified.
17. Criterion 7.07a Exhaust Fans-Kitchen (new construction):

a. Submit cut sheets for fans indicating they are Energy Star certified.

18. Criterion 7.08a Ventilation:
    a. Submit ventilation performance testing results.
    b. Submit cut sheets of all applicable fans showing they are Energy Star Certified.
19. Criterion 7.09 Clothes Dryer Exhaust:
    a. Submit photo documentation of clothes dryer exhaust to exterior using rigid ducting.
20. Criterion 7.10: Mold Prevention: Surfaces.
    a. Submit product data showing resilient flooring and water resistant countertops in kitchens and bathrooms.
21. Criterion 7.11 Mold Prevention – Tub and Shower Enclosures:
    a. Submit cut sheet showing water resistant tub and shower enclosures.
    b. Submit cut sheet showing that the gypsum wallboard in bathrooms meets mold-resistant requirements per ASTM #D3273 with a score of at least 10.
22. Criterion 7.12 Vapor Barrier Protection Strategies:
    a. Submit product data for vapor barrier showing thickness is over 8-mil.
    b. Submit photos of vapor barrier installation.
23. Criterion 7.13 Enhanced Building Envelope Design:
    a. Submit documentation of building envelope mock up. Include photographs.
    b. Submit copy of water penetration test.
24. Criterion 8.01 Building Maintenance Manual:
    a. Submit operation and maintenance manuals per section 01 70 00. To meet the requirements of Criterion 8-1 the manuals should include, at a minimum, the following:
        1) HVAC cut sheets, operation and maintenance schedule, and replacement guidance.
        2) Location of gas, electrical and water-system turnoffs
        3) Lighting equipment cut sheets, operation and maintenance schedule, and replacement guidance.
        4) Paving materials and landscaping maintenance plan.
        5) Hot water heater cut sheets, operation and maintenance schedule, and replacement guidance.
        6) Energy and water usage data collection devices.
25. Criterion 8.03 Walk Through and Orientations:
    a. Submit signup sheets for orientations for residents and property managers.
26. Criterion 5.01a Building Performance - Commissioning
    a. Submit Commissioning report per WSEC C408.
    b. Include testing required by ESDS 4.01a and 4.01b.

1.7 COORDINATION

A. Waste management coordination: Coordinate recycling of materials with Owner, Phase I environmental assessment, and as required to conform to the Construction Waste Management Plan outlined in Section 01 50 05.

1.8 SPECIFIC REQUIREMENTS

A. Contractor's Responsibilities: The design intent and the Contract Documents provide the opportunity for the program points to be achieved, and participation from the Contractor is required to achieve the program sustainability goals. The Contractor acknowledges that, as a condition of bidding (or subcontractor bidding) this Project, the Contractor will make every reasonable effort to perform the Work in such a way as to enable the stated goals to be achieved. To this end, the Contractor's responsibilities include, but are not limited to the following:

1. Compliance with the requirements of the ESDS program. However, performance criteria for all products and materials with respect to health, safety, and durability, shall take precedence over the ESDS criteria. The Contractor shall inform the Owner of any known conflicts that may result between noted "green" products or materials and the health, safety, and durability characteristics of the products or materials.
2. Provide information outlined in 01 81 13-1.6 C in PDF or other electronic format for the Evergreen Project Binder. The Evergreen Project Binder shall be an online document that is maintained by the Architect.
3. Assisting the Owner with documentation for final program certification as set forth in the Contract Documents.
4. If it is determined, during the course of the Work, that other program points (not previously noted to be obtained) may be achievable, the Contractor shall cooperate with and assist the Owner in obtaining other points. If obtaining such points requires an adjustment in the Contract Sum, adjustments shall be made as provided in the General Conditions for Changes to the Work.
5. Designating a "green" advocate within the Contractor's organization who will be responsible for ensuring compliance with the requirements.
6. The Contractor shall assist the Architect in tracking the use of materials using the checklist for reference. Included, but not limited to, are material quantities, costs, the percentage of post-consumer and post-industrial recycled content, and substantiating chain of custody for certain products.

B. Construction Management Plan

1. Per ESDS Criteria 1.01c the Contractor will implement a construction team education plan to ensure that subcontractors fully understand their responsibilities in achieving the project sustainability objectives. Information in the education plan must include:
   a. A summary of the results of the Project Priorities Survey.
   b. A summary of the sustainability goals and / or objectives detailed in the IDP.
   c. Responsibilities of each party in regard to the performance expected of the building.
   d. Details of the scope of any commissioning, verification and performance testing.
2. A written copy of the Construction Management Plan must be submitted to the Architect to include in the Evergreen Binder.

C. The Contractor will determine that conditions of construction comply with the program requirements. Do not proceed with work until unsatisfactory conditions have been corrected.

PART 2 PRODUCTS

2.1 GENERAL

A. Refer to individual specification sections and the checklist attached to this section for product information pertaining to program requirements.

2.2 LOW-EMITTING MATERIALS

A. Criteria 6.01a Healthier Material Selection for product category Paint and Coating:
   1. All products must have been tested and found compliant with the California Department of Public Health Standard (CDPH) Method V1.1 (2010), using CA Section 01350, for school or residential exposure scenarios. (Compliance with v1.2 (2017) is also acceptable).
   2. Certification by UL GreenGuard Gold, or SCS Indoor Advantage Gold are evidence of compliance.
   3. Credible laboratory test reports are also acceptable.

B. Criteria 6.01a Healthier Material Selection for product category Interior adhesives and sealants:
   1. All adhesives and sealants must have VOC content less than or equal to the thresholds provided by the South Coast Air Quality Management District (SCAQMD) Rule 1168 dated 10/6/2017. The adhesives are shown on page 12-14 of Rule 1168. VOC limits are summarized as follows:
      a. Carpet Pad Adhesive: 50 g/L.
      b. Glass, porcelain and Stone Tile adhesive: 65 g/L.
      c. Cove Base Adhesive: 50 g/L.
      d. Dry Wall Adhesive: 50 g/L.
      e. Multi-purpose Construction Adhesive: 70 g/L.
      f. Rubber Floor Adhesive: 60 g/L.
      g. Structural Wood Member Adhesive: 140 g/L.
      h. Subfloor Adhesive: 50 g/L.
      i. VCT and Asphalt Tile Adhesive: 50 g/L.
      j. Wood Flooring Adhesive: 100 g/L.
      k. All Other Indoor Floor Covering Adhesive: 50 g/L.
      l. ABS Welding Cement: 325 g/L.
      m. ABS to PVC Transition Cement: 425 g/L.
      n. CPVC Welding Cement: 400 g/L.
      o. PVC Welding Cement: 425 g/L.
      p. All Other Plastic Cements: 250 g/L.
      q. Metal Adhesive: 30 g/L.
      r. Plastic Foams Adhesive: 50 g/L
      s. Porous Material (except wood) Adhesive: 50 g/L.
      t. Wood Adhesive: 30 g/L.
      u. Fiberglass Adhesive: 80 g/L.
      v. Reinforced Plastic Composite Adhesive: 250 g/L
      w. Foam Insulation Sealant: 50 g/L.
      x. Foam Sealant: 50 g/L
      y. Grout Sealant: 65 g/L.
      z. Roofing Single Ply Roof Membrane Sealant: 250 g/L.
      aa. All Other Roof Sealants: 250 g/L.

bb. Marine Deck Sealant: 760 g/L.
cc. All Other Sealants: 250 g/L.

C. Criteria 6.01a Healthier Material Selection for product category Composite Wood:
1. All Composite Wood products exposed to the interior must be certified as compliant with California 93120 Phase 2 (CARB Phase 2).
2. Exceptions: the following exterior grade products are exempt from this requirement:
a. Wood structural panels manufactured according to PS 1-09 or PS 2-10 (or one of the standards considered by CARB to be equivalent to PS 1 or PS 2) and labeled bond classification Exposure 1 or Exterior
b. Structural wood products manufactured according to ASTM D 5456 (for structural composite lumber), ANSI A190.1 (for glued laminated timber), ASTM D 5055 (for I-joists), ANSI PRG 320 (for cross-laminated timber), or PS 20-15 (for finger-jointed lumber).

PART 3 EXECUTION

3.1 PROGRAM COMPLIANCE, GENERAL

A. Determine that conditions of construction are acceptable to comply with program requirements. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner.

B. Correction of work that is non-complying with program requirements, or that is judged by the Owner/Architect to potentially compromise the requirements of the program, shall be performed at the Contractor’s expense. Contractor shall provide the necessary documentation to demonstrate compliance of the corrected work.

END OF SECTION

Criteria			Points Claimed	Points Approved
Section 1 - Integrative Process				
1.01a	**Integrative Process Planning**		X	
	Mandatory			
	Instructions	Attach a copy of the completed Green Development Plan. Include copies of the Project Priorities Survey and Green Development Outline as backup documentation.		
	Statement			
	Reviewer's Comments			
1.01b	**Integrative Design: Documentation**		X	
	Mandatory			
	Instructions	List any and all ESDS Criteria that require the general contractor, subcontractors, or consultants to comply with a particular construction phase process (e.g., Criterion 6.05 Construction Waste Management) in other construction specifications, as appropriate		
	Statement			
	Reviewer's Comments			
1.01c	**Integrative Design: Construction Management**		X	
	Mandatory			
	Instructions	1. Affirm that construction meetings will include ESDS progress report-outs. 2. List the timeline estimates as included in the overall construction schedule. 3. Confirm that ESDS Section 8 requirements have been reviewed and understood. 4. Attach a draft of the construction team education plan.		
	Statement			
	Reviewer's Comments			
1.01d	**Integrative Design: Post Occupancy Evaluation**		Select...	
	Optional - **6 Points**			
	Instructions	Either a. Attach a copy of a POE completed for a previous project, or b. State your commitment to preparing a POE 12 months after C-of-O for this project		
	Statement			
	Reviewer's Comments			
1.02	**Advanced Tools**		Select...	
	Optional - **up to 13 Points**			
	Instructions	**State which Option is to be followed. Then:** If Option 1**:** 1. Declare the level at which the analysis will be performed 2. Attach a commitment from the firm engaged to conduct design phase modeling. If Option 2: Attach: 1. A copy of the completed Life Cycle Cost Tool, and 2. A brief statement regarding how its results were incorporated into any relevant decisionmaking If Option 3: 1. identify the IP team members, or least the relevant firms, responsible for the CNA. 2. Briefly state any decisions made or altered as a result of the CNA's findings 3. Confirm that the CNA was submitted with your funding application		
	Statement			
	Reviewer's Comments			
1.03	**Beyond ADA: Universal Design**		8	
	Optional - **8 Points**			
	Instructions	State the Option being selected, and identify which 3 strategies will be utilized. If Option 2 is being selected, attach documentation of how each strategy will be achieved (e.g. diagrams of circulation patterns, examples of light switch/outlet contrast with wall colors)		
	Statement	Option 4 is selected - Create spaces that can be accessed and used with minimal physical effort. Design all interior and exterior doors to be at least 32" clear and accessible without the use of steps or raised thresholds. Ensure all sloped surfaces have proper support on both sides. Install lever handles on all doors.		
	Reviewer's Comments			
1.04	**Healing-Centered Design**		Select...	
	Optional - **8 Points**			
	Instructions	State the Option being selected, and identify which 2 strategies will be utilized. Attach a narrative that details how the strategies will be achieved.		
	Statement			

	Reviewer's Comments			
1.05	**Active Design: Promoting Physical Activity** Optional - **8 Points**		Select...	
	Instructions	State which Option you have selected. Attach a brief narrative that explains how the Option will be achieved		
	Statement			
	Reviewer's Comments			
			Section 1 Subtotal	8 / 0
Section 2 - Location & Neighborhood Fabric				
2.01	**Appropriate Project Siting** Mandatory		X	
	Instructions	Attach documentation from the local jurisdiction stating the zoning for the property, identification of any known critical areas or resource lands within 300 feet and any resulting development restrictions		
	Statement			
	Reviewer's Comments			
2.02a	**Connections to Existing Development & Infrastructure - Urban** Mandatory for Urban New Construction		X	
	Instructions	Attach a clear and detailed Site & Vicinity Map with explanations. Clearly label and indicate on the map the areas specific to this criterion		
	Statement			
	Reviewer's Comments			
2.03a	**Compact Development** Mandatory for New Construction		X	
	Instructions	Attach the architect's density calculation and statement of correctness.		
	Statement			
	Reviewer's Comments			
2.03b	**Higher Density Development** Optional | **5 Points for New Construction**		5	
	Instructions	Attach the architect's density calculation and statement of correctness.		
	Statement	Proposed project to have 54 units on a .88 acre site.		
	Reviewer's Comments			
2.04a	**Access to Services** Mandatory for New Construction		X	
	Instructions	Attach a context map displaying locations and walking distances, with a table showing name, service type and walking distance. Google Maps offers a function to demonstrate walk distance		
	Statement	Project site is within a 0.5 mile walk distance of at least four resources (see table)		
	Reviewer's Comments			
2.04b	**Enhanced Access to Services** Optional | **5 Points**		5	
	Instructions	Update the context map prepared for Criterion 2.04a to indicate the locations of the additional resources		
	Statement	Project site is within a 0.5 mile walk distance of at least eight resources (see table 2.04a)		
	Reviewer's Comments			
2.05a	**Access to Transit** Mandatory for New Construction		X	
	Instructions	List the number of routes with stops within the required distance of the project. Provide each listed route's number of scheduled trips per weekday and weekend day (if applicable) Attach: • A context map to demonstrate that the center of the site is within the required distance of transit options. • Materials published by the relevant transit agencies that display routes counted towards complying with this Criterion		
	Statement	Site is located near Yakima Transit Routes 3, 4, 7 & 9. The closest bus stop is at the east edge of site on Fruitvale Blvd. The bus stop has at least 28 scheduled trips on a regular weekday. Stop also has weekend service.		

	Reviewer's Comments		
2.05b	**Enhanced Access to Transit**		Select...
	Optional | **2,6, or 8 Points**		
	Instructions	State how the project will comply with the chosen option. Update the map prepared for Criterion 2.05a to display the additional transit options. Attach materials published by the relevant transit agencies that display routes counted towards complying with this Criterion If seeking points for bike lanes: • State the class of bike lane(s) the project is adjacent to. • Indicate the bike lane(s) on the context map.	
	Statement		
	Reviewer's Comments		
2.06b	**Preservation of and Access to Urban Open Space**		4
	Optional | 2 or 4 Points for Urban		
	Instructions	State the option chosen and how the design will meet the requirement. Attach a clear and detailed Site & Vicinity Map that displays the areas designated as open space for residents.	
	Statement	Elks Park is a 0.4 mile walk away from the proposed site and is a total of 11.8 acres of open space with playground and play fields.	
	Reviewer's Comments		
2.07	**Walkable Neighborhoods - Sidewalks & Pathways**		X
	Mandatory except for Tribal		
	Instructions	Attach a site map clearly illustrating the existing and proposed sidewalks and all-weather pathways and where they lead to.	
	Statement	Proposed site is located on Fruitvale Blvd and will have sidewalks and all-weather pathways connecting the project to existing pedestrian sidewalks, transit stops etc.	
	Reviewer's Comments		
2.08	**Reducing Private Automobile Use**		Select...
	Optional | Up to 5 Points		
	Instructions	State which measure(s) will be used. Describe the implementation plan. If choosing car-sharing services or bicycle racks/storage, attach a site map identifying the space that will be dedicated for the amenities.	
	Statement		
	Reviewer's Comments		
2.09	**Greyfield, Brownfield, or Adaptive Reuse Site**		5
	Optional | 5 or 7 Points		
	Instructions	Provide a description and explanation that confirms the type of site. If the site has been formally declared as a brownfield (e.g. by the state Department of Ecology or a local jurisdiction), attach documentation of the declaration. Include photographs of the current state of the site. If a Brownfield, and it is safe to do so, include photographs of any specific instances of contamination identified by the associated Phase II ESA and/or remediation plan.	
	Statement	Proposed site was previously developed and is now underused and vacant.	
	Reviewer's Comments		
2.10	**Access to Fresh, Local Foods**		Select...
	Optional | **3** Points		
	Instructions	State which option the project will provide. Attach a detailed plan of how the requirements will be met. If selecting Options 1a or 1b, attach a site map with the growing space clearly identified.	
	Statement		
	Reviewer's Comments		
	Locating in Certified Communities		Select...

	Optional | **8** Points		Select...
2.11	**Instructions**	Declare the program under which the community your project is located within has achieved, or is in process to achieve, certification. Attach a copy of the certificate provided by the relevant organization, or documentation confirming the community is actively engaged in certification.	
	Statement		
	Reviewer's Comments		
	Access to Broadband: Broadband Ready		X
	Mandatory		
2.12a	**Instructions**	Affirm that broadband infrastructure will be installed at the property. Attach design drawings that clearly call out where broadband-associated infrastructure elements (conduit, network termination points, etc.) will be located.	
	Statement	Broadband infrastructure will be installed at the property.	
	Reviewer's Comments		
	Access to Broadband: Connectivity		Select...
	Optional | **6** Points		
2.12b	**Instructions**	Provide the speed of the internet service for downloading and uploading in megabits/second.	
	Statement		
	Reviewer's Comments		
		Section 2 Subtotal	19 / 0
Section 3 - Site Improvements			
	Environmental Remediation		X
	Mandatory		
3.01	**Instructions**	State the conclusion of the ESA Phase 1 and that it was submitted with your application for funding. If you did not submit your ESA Phase 1 with your funding application, attach it.	
	Statement		
	Reviewer's Comments		
	Landscaping		X
	Mandatory if Providing Landscaping		
3.02a	**Instructions**	Affirm that 50% of plantings will be native and/or adaptive species. Attach a landscape plan showing native plantings and their relation to the building(s), and which clearly shows 50% or more of the landscaped area as native and/or adaptive species.	
	Statement		
	Reviewer's Comments		
	Advanced Landscaping		5
	Optional | **5** Points		
3.02b	**Instructions**	Affirm that 90% of plantings will be native and/or adaptive species. Attach a landscape plan showing native plantings and their relation to the building(s), and which clearly shows 90% or more of the landscaped area as native and/or adaptive species.	
	Statement	Project will have 90% or more of the landscaped areas as native and/or adaptive species.	
	Reviewer's Comments		
	Landscaping-Significant Trees		0
	Optional | up **to 5** Points		
3.02c	**Instructions**	Identify the number of trees to be preserved and DBH of each. State that the project will not build within the drip line of the significant trees. Attach: • a A landscape plan showing existing significant trees, which trees are being preserved, and their relation to the building(s). • an An arborist report which evaluates each significant tree's life expectancy, health, future maintenance needs and safety. • a A brief explanation regarding the property maintenance plan for the significant trees, given the arborist report conclusions.	
	Statement	NOT BEING TAKEN ANYMORE - TREES NOT IN GOOD SHAPE	
	Reviewer's Comments		
	Efficient Irrigation		X
	Mandatory if Installing Irrigation		

3.03	**Instructions**	State which option is being pursued. • Attach a landscaping plan that displays where irrigation beyond the establishment period will be provided If Option 1: • Affirm that each of the required elements will be included in the irrigation system • State the type of distribution system being used (i.e. drip, high-efficiency spray heads) and, if using spray heads, the DU of the model(s) to be installed • Provide a draft maintenance plan for your system, including a plan for watering levels over the course of a typical year If Option 2: Attach a copy of the plan developed in accordance with the requirements stated		
	Statement	POP UPS AT GRASS; DRIP SYSTEM AT PLANTS		
	Reviewer's Comments			
3.04	**Storm Drain Labels** Mandatory		Select...	
	Instructions	Confirm your commitment to label all storm drains and inlets.		
	Statement			
	Reviewer's Comments			
			Section 3 Subtotal	5 / 0
Section 4 - Water Conservation				
4.01a	**Water-Conserving Fixtures** Mandatory		X	
	Instructions	State: • The flow rates, WaterSense, and certified per-flush performance for applicable fixtures that will be installed. • That a minimum of 15% of installed showerheads and kitchen/bathroom faucets will be tested to confirm compliance with Code • That service pressure will be established to be no more than 60 psi Attach documentation from the public water supplier that service pressure is unlikely to exceed 60 psi on a daily or seasonal basis.		
	Statement			
	Reviewer's Comments			
4.01b	**Advanced Water-Conserving Fixtures** Optional | **up to 6** Points		2	
	Instructions	As per Criterion 4.01a, but confirm the higher levels of performance. If claiming additional points for compliance with Criterion 4.06, affirm the commitment		
	Statement	Showerheads to be 1.5 GPM		
	Reviewer's Comments			

4.03b	**Lead Service Lines in New Buildings**		Select...
	Optional | 3 Points for New Construction with Demolition		
	Instructions	• Confirm when the building to be demolished was first built • Describe how it was determined whether an LSL was present. If the determination has not yet been made, describe how it will be accomplished. • If present, or if not yet determined but suspected, affirm your commitment to replace the LSL.	
	Statement		
	Reviewer's Comments		
4.04a	**Water Metering**		Select...
	Optional | 2 Points for New Construction		
	Instructions	Attach a description of how sub-meter data will be tracked, who will be responsible for monitoring it, and how the data will be used (direct billing or back-charging residents for water/sewer costs, providing consumption feedback for conservation assistance, leak detection and isolation, etc.)	
	Statement		
	Reviewer's Comments		
4.05	**Water Reuse**		Select...
	Optional | Up to 12 Points		
	Instructions	State which option is being chosen. **For Option #1**, state: • how the design will meet the requirement; • how these details will be communicated to the plumbing contractor; and • how they will be verified as compliant at construction. **For Option #**2: • State the percentage of the project's water needs that will be supplied by rainwater and/or greywater. • attach an explanation of how the project's total water need was determined and describe the design features (including cistern sizing calculation) that will be implemented to achieve the stated percentage.	
	Statement		
	Reviewer's Comments		
4.06	**Efficient Plumbing Layout & Design**		4
	Optional | 4 Points		
	Instructions	State: • How the design will meet the requirement • How the details will be communicated to the plumbing contractor • How proper installation will be confirmed	
	Statement		
	Reviewer's Comments		
4.07	**Access to Potable Water During Emergencies**		Select...
	Optional | 8 Points		
	Instructions	State which option will be pursued. Attach a short narrative describing the location of common access point/stored water/well; projects following Option 2 must include the amount of water stored.	

	Statement			
	Reviewer's Comments			
		Section 4 Subtotal	6	0
Section 5 - Energy Efficiency				
	Building Performance Standard - Commissioning		X	
	Mandatory for New Construction			
5.01a	**Instructions**	**Projects with 3 or fewer stories:** For each of the systems listed, state: • the test procedures that will be accomplished during construction and • the contracted entity who will perform each test. **All other Projects:** Provide the following information: • Roles, responsibilities and required qualifications of the certified commissioning professional(s). • A listing of the specific equipment, appliances or systems to be tested. • Estimated dates for completion of the Commissioning Plan, and submittal of the Commissioning Report		
	Statement			
	Reviewer's Comments			
	Additional Efficiency		Select...	
	Optional | **3 to 25** Points for New Construction			
5.02a	**Instructions**	If Prescriptive Credits • Attach documentation showing the energy credits used to meet code and the added energy credits to achieve additional energy savings. If Performance Based Approach • Use the analysis methodology required by code. Demonstrate that the proposed design will provide additional % reduction in energy use compared to code.		
	Statement			
	Reviewer's Comments			
	Energy Star Appliances		X	
	Mandatory for all Projects Providing Appliances			
5.03	**Instructions**	State that all clothes washers, dishwashers & refrigerators provided will be ENERGY STAR.		
	Statement			
	Reviewer's Comments			
	Central Laundry		3	
	Optional | **3** Points			
5.04	**Instructions**	State that the project will provide ENERGY STAR-labeled centralized laundry facilities and will not install in-unit washers or dryers or hook-ups.		
	Statement	Project will provide Energy Star-labeled centralized laundry facilities and will not install in-unit washers or dryers or hook-ups.		
	Reviewer's Comments			

5.07a	**Photovoltaic Ready - New Construction** Mandatory for New Construction		X
	Instructions	Explain the plan including orientation, unobstructed exposure, conduit route and location of terminations. Attach the design and engineering analysis that establishes the parameters of the installation that demonstrate the listed requirements	
	Statement		
	Reviewer's Comments		

5.08a	**Domestic Water Heating** Mandatory for New Construction		X
	Instructions	Affirm that neither oil nor propane are to be used as an energy source for water heaters Document that the water heaters to be installed are WSEC-compliant by clearly stating the WSEC requirements met (i.e. equipment type, size category, subcategory or rating condition, and performance required).	
	Statement		
	Reviewer's Comments		

			Section 5 Subtotal	3	0

Section 6 - Materials

6.01a	**Healthier Material Selection**		X	
	Mandatory			
	Instructions	confirm that all relevant materials will meet the Standard		
	Statement	All relevant materials will meet Standard.		
	Reviewer's Comments			
6.01b	**Healthier Material Selection - Advanced**		Select...	
	Optional | **up to 15** Points			
	Instructions	declare which Product Categories, Options, and points you are pursing, and confirm these items are addressed in the IDP		
	Statement			
	Reviewer's Comments			
6.01c	**Healthier Material Selection - Toxin-Free Recycled Content**		Select...	
	Optional | up to 3 Points			
	Instructions	List which building materials you will be specifying with recycled content, and Confirm that if any of these materials are submitted by an installing contractor, whether specified or not, with recycled content, they will only be approved once an appropriate declaration is provided.		
	Statement			
	Reviewer's Comments			
6.02a	**Embodied Carbon Reduction - Materials**		Select...	
	Optional | Up to 11 Points			
	Instructions	State which option is being pursued. **If Concrete:** State how the GWP of the concrete mix designs is being quantified **If Wood, Non-Composite:** State: • Whether certified sustainably harvested wood and/or salvaged wood is to be used, • Under which system the wood to be used will be certified as sustainably harvested • The percent in aggregate of cost that is to be used. **If Wood, Mass Timber:** State: • The structural elements Mass Timber will be used for in place of structural steel/concrete. • Under which system the Mass Timber to be used will be certified as sustainably harvested **If Rigid Insulation:** Specify which insulating material is to be used.		
	Statement			
	Reviewer's Comments			
6.02b	**Embodied Carbon Reduction - Regional Sourcing**		Select...	
	Optional | Up to 4 Points			
	Instructions	State which materials to be used will qualify.		
	Statement			
	Reviewer's Comments			
6.03	**Construction Waste Managament**		3	
	Optional | Up to **5** Points			
	Instructions	State: • the waste management method chosen. • that the approved contractor submittal of the construction waste plan will be available on the job site detailing how reusable/recyclable materials are redirected from the landfill and where each material goes. • that waste receipts will be available on the job site.		

	Statement			
	Reviewer's Comments			
	Reduced Heat Island Effect: Roofing		Select...	
	Optional | **2** Points			
6.04a	**Instructions**	• State which option is applicable • Affirm that materials that are certified to achieve the required performance characteristics are to be used		
	Statement			
	Reviewer's Comments			
	Reduced Heat Island Effect: Paving		Select...	
	Optional | **2** Points			
6.04b	**Instructions**	state that light-colored/high-albedo materials and/or an open-grid pavement, with a minimum Solar Reflective Index of 30 over at least 50 percent of the site's hardscaped area will be used. Attach a map of all paved areas showing the portion that will reduce the heat-island effect and the type of material.		
	Statement			
	Reviewer's Comments			
	Socially Sustainable Products		Select...	
	Optional | **Up to 3** Points			
6.05	**Instructions**	State which socially sustainable products will be used, and that documentation will be provided to Commerce after construction bid. Attach an explanation of each manufacturer, the product used in the project, and how they support a broader socially sustainable mission. Provide a website supporting your information or written documentation from the manufacturer with their contact information		
	Statement			
	Reviewer's Comments			
			Section 6 Subtotal	3 | 0
Section 7 - Healthy Living Environment				
	Combustion Equipment		X	
	Mandatory			
7.01	**Instructions**	state: • Whether water heaters will be located in the conditioned space; • Whether fossil fuel fired heaters will be used; and • That any such heaters will be either direct power vented or combustion sealed		
	Statement			
	Reviewer's Comments			
	Garage Isolation		n/a	
	Mandatory			
7.02	**Instructions**	Attach drawings that make clear whether there is connection between living and garage spaces. State whether there is any connection between living and garage spaces. If connection exists, affirm the following: • That a continuous air tight barrier will be provided between the living space and any attached garage space; • That walls and ceilings common to the living and attached garage spaces will be visually inspected to ensure air seal before insulation is installed • That any and all doors connecting the living and attached garage space will be fixed with gaskets or otherwise made substantially airtight. • no ductwork or air handling equipment will be located in a garage space		
	Statement	Project will not contain a garage.		
	Reviewer's Comments			
	Integrated Pest Management		X	
	Mandatory			
7.03	**Instructions**	affirm that: • sealing of all penetrations will be done and include what materials will be used to prevent pest and rodent entry. • An IPM that includes resident guidance will be developed prior to the project receiving its Certificate of Occupancy (or equivalent). If an IPM that includes resident guidance has been developed already, attach it.		
	Statement			
	Reviewer's Comments			

7.04	**Lead-Safe Work Practices**		X
	Mandatory for Rehab, and for New Construction Projects Involving Demolition		
	Instructions	State the original construction completion date of the relevant structures. Attach documentation of the relevant structure's original build date. **For structures built before 1978:** • Affirm that o lead-safe work practices will be followed, and o the contractor performing the work will be Renovation, Repair and Painting certified at a minimum. OR • Affirm that renovation work was previously completed that mitigated any lead contamination issues • Attach documentation of the prior renovation work that mitigated lead contamination issues.	
	Statement		
	Reviewer's Comments		
7.05a	**Smoke-Free Units and Common Areas**		X
	Mandatory		
	Instructions	Confirm that: • A smoke-free policy in all common and individual living areas, including decks and patios, in unit leases and within 25 feet of building entries or ventilation intakes (including operable windows) will be implemented and enforced. • Unit lease language will prohibit smoking in these locations and that it is a violation of the lease to smoke. • If smoking areas are to be provided, attach copies of project drawings that clearly display their location, and distances required under RCW.	
	Statement		
	Reviewer's Comments		
7.05b	**Smoke-Free Property**		Select...
	Optional | **7** Points		
	Instructions	Confirm that no smoking will be allowed anywhere on the property.	
	Statement		
	Reviewer's Comments		
7.07a	**Exhaust Fans - Kitchen**		X
	Mandatory for New Construction		
	Instructions	State that ENERGY STAR certified kitchen fans will be installed and vented to the outside. If recirculating range hoods are to be installed, confirm that: • the range hood will operate automatically when the range is in operation, and • a plan for regular filter inspection and replacement will be included in the project's Management Plan and/or Operations & Maintenance Manual If intakes for the whole-house ventilation system are located in unit kitchens, state that an appropriate filter system will be installed to protect the system from kitchen-generated combustion products	
	Statement		
	Reviewer's Comments		

7.08a	**Ventilation** Mandatory for New Construction (single family & ≤3 Stories)		X
	Instructions	Confirm that the installed ventilation system will be commissioned according to the listed requirements. Or If Exhaust-only ventilation is to be installed, affirm that all fans will be ENERGY STAR certified.	
	Statement		
	Reviewer's Comments		
7.08c	**Ventilation - Outside Air Filtration** Optional | 8 Points		Select...
	Instructions	• State that filter boxes will be installed according to the listed requirements • Briefly describe the anticipated deployment schedule (e.g. "filters installed when air quality listed as 'Unhealthy for Sensitive Groups' or worse", "filters installed during wildfire season, roughly July through September") • Affirm your commitment to regular inspection and replacement of installed filters during the indicated deployment period(s) Attach Drawings that clearly indicate the locations of filter boxes	
	Statement		
	Reviewer's Comments		
7.09	**Clothes Dryer Exhaust** Mandatory		X
	Instructions	If installing standard clothes dryers, affirm that exhaust will be ducted directly to the building exterior, utilizing rigid-type ductwork Or If installing condensing and/or heat pump dryers, affirm that output will be plumbed directly to a drain.	
	Statement	Clothes dryer exhaust will be ducted directly to the building exterior with rigid-type ductwork.	
	Reviewer's Comments		
7.10	**Mold Prevention: Surfaces** Mandatory		X
	Instructions	Affirm that durable, cleanable surfaces will be installed throughout bathrooms, kitchens and laundry rooms.	
	Statement	Durable, cleanable surfaces will be installed throughout bathrooms, kitchens and laundry rooms.	
	Reviewer's Comments		
7.11	**Mold Prevention: Tub & Shower Enclosures** Mandatory		X
	Instructions	State which materials for tub and shower enclosures will be used.	
	Statement		
	Reviewer's Comments		
7.12	**Vapor Barrier Strategies** Mandatory for New Construction and for Rehab Involving Foundation Work		X
	Instructions	Affirm that 8-mil minimum thickness cross-laminated polyethylene will be installed on crawl space floors. In addition, affirm that: • the poly will be extended at least 12 inches up on piers and foundation walls • joints in the poly will overlap at least 12 inches. • Likely "high-traffic" areas of the crawl space will be lined with foam board to protect the poly	

	Statement	8-mil min thickness cross-laminated polyethylene will be installed on crawl space floors. The poly will be extended at least 12 inches up on piers and foundation walls, joints will overlap at least 12 inches and high-traffic areas of the crawl space will be lined with foam board to protect the poly.		
	Reviewer's Comments			
7.13	**Enhanced Building Envelope Design** Optional - **up to 8** Points		8	
	Instructions	State the option(s) chosen and provide a description of how the objective will be achieved. Affirm that inspection reports and photos of any mockups will be available on the job site.		
	Statement			
	Reviewer's Comments			
			Section 7 Subtotal	8 / 0
Section 8 - Operations, Maintenance & Resident Management				
8.01a	**Building Maintenance Manual - Sustainability Supplement** Mandatory		X	
	Instructions	State: • that a copy of the Building Maintenance Manual – Sustainability Supplement will be submitted to any ESDS-adopting funders involved in the project before construction activities are completed (i.e. prior to C-of-O) • the estimated date of the Supplement's submittal.		
	Statement			
	Reviewer's Comments			
8.01b	**O&M Instructions for Maintenance Staff** Optional | **7** Points		7	
	Instructions	state whether instructions will be physically affixed or provided digitally. If physically affixed: • State which systems will have operating and maintenance instructions affixed • The approximate locations in which instructions will be placed If provided digitally: • State which systems will have operating and maintenance instructions provided in a searchable format • Affirm that appropriate devices will be issued to maintenance staff, and that staff will be trained as necessary to utilize the device(s) effectively		
	Statement			
	Reviewer's Comments			
8.02	**Resident/Owners' Manual** Mandatory		X	
	Instructions	State: • That a copy of the Resident/Owner's Manual will be submitted for review to any ESDS-adopting funders involved in the project before construction activities are completed (i.e. prior to C-of-O); include an estimated date of submittal. • That a copy of the Resident/Owner's Manual will be provided to each resident at move-in, or each homeowner at handover.		
	Statement			
	Reviewer's Comments			
8.03	**Walk-Throughs and Orientations to Property Operation** Mandatory		X	
	Instructions	affirm: • that orientations will be provided to residents and property managers within the stated timelines. • that records of walkthroughs will be made available to monitoring staff upon request		
	Statement			
	Reviewer's Comments			
	Project Data Collection Optional | **5** Points		Select...	

8.04	**Instructions**	• State which data collection option was chosen, • Affirm your commitment to tracking for at least five years post construction completion • Specify which benchmarking platform will be utilized. Attach a copy of your plan for the data. This should include: • Collection and quality control roles • Positions at your organization that will be assigned to the roles • An outlined process for putting the data into action to positively affect utility usage	
	Statement		
	Reviewer's Comments		
8.05	**Educational Signage** Optional | **1** Point		Select...
	Instructions	Confirm that educational signage and/or educational material will be provided onsite.	
	Statement		
	Reviewer's Comments		
8.05	**Educational Signage** Optional | **1** Point		Select...
	Instructions	State your commitment to posting your certification plaque. Include any specific language to be included, especially if you intend to highlight particular elements (e.g. % of Additional Efficiency beyond code requirements achieved under Criterion 5.02a). Attach drawings that clearly display the location where the plaque will be displayed, and document how it will be visible without extraordinary effort.	
	Statement		
	Reviewer's Comments		
		Section 8 Subtotal	7 | 0
		Overall ESDS Total	**59** | **3**

SECTION 02 41 19

STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes for the site:
1. Exterior site work including:
a. Cutting and trenching related to utilities and building services, tree and planting installations.
b. Removal of existing sidewalk and streets indicated on Civil Engineer's plans.
c. Shall be coordinated with all related disciplines, as well as City and utility providers.
2. Demolition of existing site features including:
a. Concrete sidewalks where indicated.
b. Concrete pavement where indicated.
c. Asphalt pavement where indicated.
d. One single family residential home and outbuilding.
e. One CMU building – previously known as "Joe's Grinding" per Fulcrum Environmental Assessment.
f. One single story maintenance office.
g. Existing trees and landscaping as indicated on Civil Plans.
h. Existing exterior mechanical equipment including condensing units where indicted.
i. Existing chain link security fencing on Fruitvale Boulevard.
j. Existing chain link security fencing on site.
k. Existing signs on Fruitvale Boulevard.
3. Demolition of existing site utilities including:
a. Existing portion of side sewers indicated on plans.
b. Existing Gas Line indicated on plans.
c. Existing portion of water lines indicated on plans.
d. Existing overhead power lines indicated on plans.
4. Removal and disposal of all demolished materials.

B. Abatement of hazardous materials:
1. The Owner has provided a phase 2 Environmental Assessment and specification section 02 81 00 Environmental Conditions by Fulcrum Environmental Consulting. Contractor shall follow all precautions and procedures included in the Assessment, Specification Section 02 81 00 and other required documents provided by the Owner, or as required by law when working with hazardous materials.
2. The contractor is responsible for asbestos abatement for all existing buildings and on-site structures during demolition.
a. The existing residence, residence out-building and Joe's Grinding building have been inspected for asbestos. These buildings have

been found to contain Asbestos Containing Materials. Inspection reports are available for contractor reference.

b. The former Maintenance Office has not been inspected for asbestos. The contractor is responsible for completing an asbestos inspection.

3. The Contractor is responsible for removing and properly disposing of contaminated soil per specification section 02 81 00.
4. The contractor is required to complete a waste characterization test for the buildings to be demolished.
5. There are fluorescent lamps and suspect PCB-containing ballasts in the buildings to be demolished. These items are to be removed from the buildings prior to demolition and segregated for recycling and disposal.
6. Several large pieces of equipment remaining in the Joe's grinding building contain oil in the bottom of the reservoirs that will require removal and disposal prior to structure demolition.
7. A refrigerator and air conditioning units in the buildings contain regulated refrigerants that will require specialized handling and/or decommissioning prior to building demolition.
8. The Architect has not prepared documents related to hazardous materials, and will not be responsible for administering that work.

C. Related Sections:
1. Section 01 50 00 – Temporary Utilities.
2. Section 01 30 00 – Administrative
3. Section 01 50 05 – Construction Waste Management and Disposal
4. Section 01 81 13 – Sustainable Design and Construction Procedures
5. Section 02 81 00 – Environmental Conditions

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Demolition Schedule: Indicate overall schedule and identify interruptions required for each utility, and building services.

C. ESDS Submittal: Submit documentation showing that demolition contractor is Renovation, Repair and Painting certified. Contractor to insert documentation into ESDS Binder per 01 81 13 – 1.6 D 16.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities - including those discovered during demolition - and subsurface obstructions.

1.4 QUALITY ASSURANCE

A. Demolition contractor is to be Renovation, Repair and Painting certified.

B. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

C. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

D. Obtain required permits from authorities having jurisdiction.

1.5 PRE-DEMOLITION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-demolition meeting.

B. Convene minimum one week prior to commencing work of this section.

C. The Owner and the Owner's Environmental Consultant are required to attend.

1.6 SCHEDULING

A. Section 01 32 16 - Construction Progress Schedule: Requirements for scheduling.

B. Schedule Work to coincide with new construction.

C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Neighbor's operation in adjoining spaces.

D. Perform work:
1. Between hours of 8:00AM and 6:00PM unless further restricted by the local municipality.

1.7 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent properties.

B. Cease operations immediately if any structure on adjacent properties appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

D. Prevent movement of adjacent structure; provide temporary bracing and shoring required to ensure safety of existing adjacent structures.

3.2 SALVAGE REQUIREMENTS

A. Owner to salvage any desired building components, equipment and furnishings before the start of demolition.
   1. Schedule of items to be salvaged:
      a. Air compressor in the existing Joe’s Grinding building, identified by owner.
      b. Submersible tank in the existing Joe’s Grinding building, identified by owner.

3.3 DEMOLITION

A. Conduct demolition to minimize interference with adjacent buildings.
   1. Cease operations immediately when adjacent structures appears to be in danger and notify Architect/Engineer.
   2. Contractor to survey the location of adjacent buildings on neighboring properties to the north and east of the site prior to demolition / excavation.

B. Maintain protected egress from and access to adjacent existing buildings at all times.

C. Do not close or obstruct roadways, alley or sidewalks without permits.

D. Disconnect and remove designated utilities within demolition areas.

E. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

F. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

G. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

H. Remove temporary Work.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formwork for cast-in place concrete, form accessories, and form stripping.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 03 20 00 - Concrete Reinforcing.
   2. Section 03 30 00 - Cast-In-Place Concrete.
   3. Section 07 26 00 – Vapor Barriers: Vapor barrier under slab on grade.
   4. General Structural Notes on the drawings.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. ACI 301 - Specifications for Structural Concrete.
   3. ACI 318 - Building Code Requirements for Structural Concrete.
   4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association: AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association: APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. American Society of Mechanical Engineers: ASME A17.1 - Safety Code for Elevators and Escalators.

E. ASTM International:
   1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
   2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

F. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. ESDS Binder:

1. VOC verification: Include EPD or MSDS data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 QUALITY ASSURANCE

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

B. Perform Work in accordance with ACI 347, ACI 301, and ACI 318.

C. For wood products furnished for work of this Section, comply with AF&PA.

D. Maintain one copy of each document on site.

E. Qualifications

1. Where required by local jurisdiction design formwork under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Washington.

1.5 WARRANTY

A. One-year standard warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental requirements.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor to meet project requirements.

2.2 METAL AND FIBERGLASS FORMS

A. Accepted in lieu of wood forms.

B. Matched, tight-fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete, as accepted by Architect.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, metal, fixed length, cone type, with waterproofing washer, free of defects capable of leaving holes larger than 1-1/4 inch in concrete surface. Note that form tie holes will be patched in the finished work. Refer to Section 03 30 00 for finishing requirements.

B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.

C. Form Anchors and Hangers:
   1. Do not use anchors and hangers in exposed concrete leaving exposed metal at concrete surface.
   2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
   3. Penetration of structural steel members is not permitted.

D. Form Release Agent:
   1. Shall be delivered in manufacturer's sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future-applied coatings and finishes.
   2. Vegetable-based: paraffin and waxes shall not be used when a concrete finish is specified.
   3. Environmental requirements:
      a. Waterborne.
      b. Low VOC.
      c. Shall not contain motor oil, diesel oil or other toxic substance.
   4. Manufacturers:
      a. Conspec Marketing and Manufacturing Co. Inc., Enviroform and Aquastrip.
      b. Cresset Chemical Co., Crete-Lease 20-VOC.
      c. Franmar Chemical Inc., Asphalt Release.
      d. Leahy-Wolf Company, Bio-Form.
      e. M.J. Doud, Inc., Greenplus Form Release Agent ES.
      f. Substitutions: Section 01 60 00 - Product Requirements.

E. Corners: Chamfer, rigid plastic or wood strip type; size per drawings; maximum possible lengths.

F. Vapor Barrier: under slabs on grade, refer to Section 07 26 00 Vapor Barriers and Vapor Retarders.

G. Waterstop: Bentonite Joint Filler per 07 17 00.

H. Other Embedded Items: Use waterstops, sleeves, inserts, anchors, reglets, dovetail anchor slots, and other embedded items of the material and design indicated in the Contract Documents.

I. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms: Earth forms are not permitted.

B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.

E. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum of 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.

5. When placed on ground, protect against undermining, settlement or accidental impact.

F. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with reference standards.

G. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

H. Obtain Architect/Engineer’s approval before framing openings in structural members not indicated on Drawings.

I. Install chamfer strips on external corners.

J. Install void forms in accordance with manufacturer's recommendations.

K. Do not reuse wood formwork more than two times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 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 are indicated to 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.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to 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 straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.

2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings. Note that form holes will be patched in the finished work. Refer to Section 03 30 00 for finishing requirements.

H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.
5. Refer to Structural Drawings for additional requirements.

J. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Specification sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318, IBC 1906 and Structural Drawings for size and location limitations.

K. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings. Obtain Architect/Engineer’s approval before cutting.

L. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

M. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane will not be permitted.

N. Cleanouts and Access Panels:
   1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
   2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 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 in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as suggested in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI reference standards.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Inspection Company after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See Section 01 50 05.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete reinforcing as follows:
   1. Reinforcing bars and reinforcement accessories.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 - Cast-In-Place Concrete.
   3. General Structural Notes on the drawings.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 315 - Details and Detailing of Concrete Reinforcement.
   3. ACI 318 - Building Code Requirements for Structural Concrete.
   4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   6. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

C. American Welding Society: AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
   1. CRSI - Manual of Standard Practice.
   2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.

C. Product literature: Fibrous concrete reinforcement products.

D. Certificates: Submit AWS/WABO qualification certificate for welders employed on the Work.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301, and ACI 318. In the event of conflict, notify the Architect.

B. Prepare shop drawings in accordance with ACI SP-66.

C. Maintain one copy of each document on site.

D. Qualifications:
1. Welders: AWS/WABO qualified within previous 12 months.

1.5 WARRANTY

A. One-year standard warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Follow manufacturers written instructions for storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Follow manufacturer’s written instructions or industry standards for environmental requirements.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Deformed reinforcing steel: ASTM A615, Grade 60 (60 ksi yield strength), steel bars, unfinished. Refer to the General Structural Notes on the drawings.

B. Low Alloy reinforcing steel to be welded: ASTM A706, Grade 60 (60 ksi yield strength), steel bars, unfinished. Refer to the General Structural Notes on the drawings.

C. Welded Plain Wire Fabric: Refer to the General Structural Notes on the drawings.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including load bearing pad on bottom to prevent vapor barrier puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel type; size and shape to meet Project conditions.

D. Deformed Bar Anchors: ASTM A496, welded deformed bar stud anchors for concrete connections. Manufacture for automatic stud welding, as instructed by manufacturer. Refer to the General Structural Notes on the drawings.

E. Mechanical Splices of reinforcing bars: Shall be per an ICC Evaluation Services approved system.
   1. Conform to ACI 318 as modified by IBC Chapter 19.
   2. Type 1 Splice: Develop minimum 125 percent of specified yield strength (f_y) of the reinforcing as required for tension or compression.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with ACI 318 and CRSI Manual of Standard Practice.
   1. Bend and straighten reinforcing steel in accordance with ACI 318.
   2. Do not bend or straighten reinforcing steel that is partially embedded in concrete.
   3. No heating of reinforcing steel is permitted.

B. Form standard hooks for 180-degree bends, 90-degree bends, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Where indicated or accepted, weld reinforcement in accordance with AWS D1.4 using AWS/WABO Certified Welders.

F. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

PART 3 EXECUTION

3.1 PREPARATION

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

3.2 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.

B. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

C. Do not displace or damage vapor barrier.

D. Accommodate placement of formed openings.

E. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

F. Splices: Conform to ACI 318 as modified by IBC Chapter 19 and the Structural Drawings.
   1. Lap splices: Chapter 12 of ACI 318.
   2. Mechanical Splices: Conform to splicing device manufacturer's instructions and ICC Evaluation Services Report.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Install reinforcement within the tolerances of ACI 117, ACI 318 and IBC Chapter 19.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318 and Chapter 17 of the IBC. Refer to General Structural Notes on the drawings.

C. Provide free access to Work and cooperate with appointed firm.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Footings and stem walls as shown in structural drawings.
2. Elevator pit as shown in structural drawings.
3. Concrete slab on grade as shown in structural drawings.
4. Exterior pads and foundations for mechanical equipment as shown in Civil and Architectural drawings.
5. Exterior foundations for monument signs.
6. Footings for exterior furnishings per manufacturer requirements. See landscape plans for locations.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
1. None.

D. Related Sections:
1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 03 20 00 - Concrete Reinforcing.
3. Section 07 26 00 – Vapor Retarders.
4. Section 07 90 00 - Joint Protection.
5. Divisions 22 and 23: Mechanical items for casting into concrete.
6. Division 26: Electrical items for casting into concrete.
7. Division 32: Exterior Improvements.
8. General Structural Notes on the drawings.

1.2 REFERENCES

A. American Concrete Institute:.
1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
4. ACI 303R - Guide for Cast-In-Place Architectural Concrete Practice.
5. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
6. ACI 305 - Hot Weather Concreting.
7. ACI 306.1 - Standard Specification for Cold Weather Concreting.
8. ACI 308.1 - Standard Specification for Curing Concrete.
9. ACI 309R - Guide for Consolidation of Concrete.
10. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
5. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
9. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
13. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
14. ASTM C928 - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair.
15. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
16. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
17. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
18. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
19. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
20. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
21. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
22. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
23. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
24. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures. Submit plan drawings showing locations of isolation joints, control joints, and construction joints for slab-on-grade concrete.

C. Design Data:

1. Submit concrete mix design for each concrete strength noted in the General Structural Notes on the drawings. Submit separate mix designs when admixtures are required for the following:
   a. Hot and cold weather concrete work.
   b. Air entrained concrete work.
   c. Exposed concrete work with shrinkage reducing admixture.
2. Include for each mix design:
   a. Method and test data used to establish mix proportions.
   b. Concrete compressive strength.
   c. Water/cement ratio, corresponding cement content and water content.
   d. Admixtures and additives.
   e. Slump.
   f. Air entrainment.
   g. Ingredients, proportions, and source of materials.
   h. Location and intended use.
   i. Shrinkage data for Post-tensioned concrete mix designs.
3. Do not use calcium chloride containing products.

D. CLOSEOUT SUBMITTALS
1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
2. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 318.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

1.5 WARRANTY

A. One-year standard warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Follow manufacturer's written instructions for storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I or Type II. Type III cement may be used for cold weather construction.

B. Normal Weight Aggregates: ASTM C33. Aggregates shall be free from any substance that may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete.

C. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

A. Refer to the General Structural Notes: The use of admixtures is the responsibility of the Contractor, and only as approved by the Structural Engineer.

B. Air Entrainment: ASTM C260. Master Builders "Micro-Air", Grace "Daravair", Sike "AEA-15", or approved equal.

C. Shrinkage Reducing Admixtures: Provide approved admixture for concrete mixes at exposed slabs-on-grade and exposed concrete walls, including stem walls. Admixture shall be capable of producing concrete with a maximum shrinkage percentage of 0.025%. Admixture shall be approved for use in freeze-thaw environments, such as Eclipse 4500 by Grace Concrete Products, or Tetraguard AS21 by BASF. For bidding purposes, assume dosage of 1 gallon per cubic yard. Confirm final dosage with manufacturer to achieve maximum shrinkage limit.

2.3 ACCESSORIES

A. Bonding Grout and repair materials: Use products in accordance with manufacturer's printed instructions.
   1. Manufacturers:
      a. Portland Cement mortar modified with a latex acrylic, non re-emulsified bonding agent conforming to ASTM C1059 Type II. Acceptable products include Euclid Chemical Co. "Flex-Con", Dayton "Day-Chem Ad Bond (J-40)".
      b. Epoxy mortars and epoxy compounds that are moisture insensitive during application and after curing and that embody an epoxy binder conforming to ASTM C881.
      c. Shrinkage-compensating or nonshrink Portland Cement grout conforming to ASTM C1107. Acceptable products include Master Builders "Masterflow 713 Grout", Dayton "Sure-Grip High Performance Grout", Burke "Non-Ferrous Non-Shrink Grout", or approved equal.

d. Packaged, dry concrete repair materials conforming to ASTM C928. Acceptable products include Master Builders "Emaco T415", Dayton "HD-50", Burke "Fast Patch 928", or approved equal.

e. Substitutions: Section 01 60 00 - Product Requirements.

B. Vapor Barrier: refer to Section 07 26 00 - Vapor Barriers and Vapor Retarders.

C. Dissipating Resin Curing Materials: liquid type membrane forming curing compound complying with ASTM C309, Type I. Curing compound must be of a type that does not inhibit subsequent moist curing operations. The film shall chemically break down in a two-to-four-week period and shall not affect adhesion of coverings or membranes. Acceptable products are Burke "RES-X Curing Compound", Euclid Chemical Co "Kurez DR", Dayton "Day-Chem Rez Cure (J-11-W)", or approved equal.

D. Cure and Seal Combination Materials (exposed interior concrete slabs): Conform to ASTM C309 (Types 1 and 1D, Class B) or ASTM 1315. Acceptable products include Master Builders "Acryseal", Euclid Chemical Co. "Rez-Seal", Sonneborn "Kure-N-Seal", or approved equal.

E. Moisture retaining cover: waterproof sheet materials conforming to ASTM C171.

F. Concrete Reinforcing Fibers: ASTM C1116, refer to the General Structural Notes on the drawings.

2.4 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301. Prepare mix designs for each type and strength of concrete by Field Experience Method or, if available, by Laboratory Trial Batch Methods. Mix proportions shall produce consistent and workable concrete that can be worked readily into forms and around reinforcement without segregation or excessive bleeding.

1. Field Experience Method: if Field test data is available, in accordance with ACI 301, submit for acceptance the mixture proportions along with the field test data.

2. Trial Batch Method: Use an independent, qualified testing facility for preparing and reporting proposed mix designs. All expenses connected with such testing and submittals shall be borne by the Contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and ACI 318.

B. Notify testing laboratory minimum 24 hours prior to commencement of pouring operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and vapor barrier sheet are not disturbed during concrete placement.

D. Install vapor barrier under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight using products and procedures recommended by the sheet manufacturer.

E. Repair vapor barrier damaged during placement of concrete reinforcing, following manufacturer's recommended procedures.

F. Separate slabs on grade from vertical surfaces with ½" inch thick joint filler unless otherwise noted on the Drawings.

G. Install construction joints and crack control joints after review with Architect. Set top to required elevations. Secure to resist movement by wet concrete.

H. Deposit concrete at final position. Prevent segregation of mix.

I. Place concrete in continuous operation for each panel or section determined by predetermined joints.

J. Consolidate concrete.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

L. Place concrete continuously between predetermined expansion, control, and construction joints.

M. Saw cut control joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

N. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.4 CONCRETE FINISHING

A. Provide formed concrete walls with smooth formed finish. Form tie holes shall be expressed in the finished work; remove ties and fill holes neatly to within ½" of surface. Refer to 03 10 00 for installation.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Protect ground and polished concrete with protection board. Follow manufacturer's instructions to prevent staining of concrete.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

D. Cure concrete in accordance with ACI 308.1. Cure floor surfaces in accordance with ACI 301.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318, the 2009 IBC, and the permitting authority.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to Structural Engineer for review prior to commencement of Work.

E. Concrete Inspections:
1. Reinforcing steel placement prior to concrete pours.
2. Continuous Placement Inspection: Inspect for proper installation procedures.
3. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
3. Sample concrete and make one set of five cylinders for every150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M or ASTM C231.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

6. Measure shrinkage reduction in accordance with ASTM C157 prior to construction to verify maximum shrinkage limit of 0.025%.

H. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
2. Test Acceptance: In accordance with ACI 318.
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Retain two cylinders for 56 days, or as otherwise requested by Architect/Engineer.
6. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: ASTM C42/C42M.
2. Test Acceptance: In accordance with ACI 318.
3. As directed by Architect/Engineer, drill cores for each failed strength test from concrete represented by failed strength test.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer, and in accordance with ACI 301.

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 03 54 00

GYPSUM CEMENT UNDERLAYMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Liquid applied gypsum based self-leveling floor underlayment for installation over wood framed floors.
   2. Sound deadening mat in residential units at levels 2-4.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. Gypsum underlayment to be a minimum 1” thick.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 09 65 16 – Resilient Sheet Flooring.
   3. Section 09 65 19 – Resilient Tile Flooring.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit physical characteristics and product limitations.

C. Manufacturer's Instructions: Indicate mix and application instructions.

D. Assembly Tests: Submit data on tested floor/ceiling assemblies. Coordinate with Sections 06 17 33 and 09 21 16. Data must show compliance with fire rating and acoustic requirements.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Qualifications:
   1. Manufacturer and Applicator: Company specializing in manufacturing and installing Products specified in this section with minimum three years experience.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install underlayment until floor penetrations and peripheral work are complete.

C. Maintain manufacturer's recommended minimum ambient temperature and humidity for duration noted in manufacturer’s written instructions.

D. During curing process, ventilate spaces to remove excess moisture per manufacturer’s written instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. USG Inc.

2.2 MATERIALS

A. Underlayment:
   1. USG Levelrock 2500 Series Underlayment. Thickness as noted on drawings.

B. Water: Potable and not detrimental to underlayment mix materials.

C. Primer: Manufacturer's recommended type.

D. Joint and Crack Filler: Latex based.

2.3 SOUND DEADENING PAD

A. Manufacturers:
   1. USG Inc. Levelrock SAM-N12 Sound Attenuation Mat.

B. Place in all residential units under resilient flooring (LVT flooring.)

2.4 MIXING

A. Site mix materials.

B. Mix to achieve following characteristics:
   1. Density: 115 lb/cu ft minimum dry density.
   2. Compressive Strength: 2,500 psi minimum in accordance with ASTM C472.
   3. Coordinate compressive strength with requirements of flooring manufacturer. See 09 65 19.

C. Mix to self-leveling consistency.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are clean, dry, unfrozen, do not contain petroleum by-products, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate if required by the manufacturer. Allow primer to dry.

D. Close floor openings.

3.3 PLACEMENT OF SOUND DEADENING PAD

A. Schedule the sound deadening pad system as late as possible in the construction cycle. If sound deadening pad is to be installed before drywall, then 3.4 lb. sq. yd. galvanized metal lath must be loose laid over the entire surface.

B. Install sound deadening pad following manufacturer's written instructions.

C. Install in locations indicated in drawings. Generally place in floor ceiling assemblies in wood structure over residential units.

D. Priming: Prime sound deadening pad as required by manufacturer.

3.4 APPLICATION

A. Install underlayment in strict compliance with the manufacturer's written instructions.

B. Place to thickness as indicated on Drawings.

3.5 CURING

A. Air cure.

B. Provide adequate ventilation above and below for complete drying. If required, heat spaces to ensure drying.

3.6 APPLICATION TOLERANCE

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface: Level to 1/8 inch in 10 ft.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Placed Material: Inspecting for conformance to specification requirements.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting Finished Work.

B. Do not permit traffic over unprotected floor underlayment surfaces.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Structural shapes, channels and angles, tubes and pipe, plates and bars, fasteners, connectors, and anchors, and grout.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 018113 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 05 500 0 - Metal Fabrications.
   2. Section 06 10 00 – Rough Carpentry.
   3. General Structural Notes on the structural drawings.

1.2 REFERENCES

A. American Institute of Steel Construction:
   1. AISC Code of Standard Practice for Steel Buildings and Bridges.
   2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
   3. AISC Seismic Provisions for Structural Steel Buildings.
   4. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

B. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. American Welding Society:
   1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. Research Council on Structural Connections: RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, connections and fasteners.

2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
3. See additional requirements in general structural notes.

C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

D. Manufacturer's Mill Certificate: Certify products meet or exceed specified requirements.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Seismic Provisions for Structural Steel Buildings.
3. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

B. Qualifications:
1. Fabricator: Company specializing in performing Work of this section with minimum 5 years experience.
2. Erector: Company specializing in performing Work of this section with minimum 5 years experience.
3. Shop Painter: Company specializing in performing Work of this section with minimum 5 years experience.
4. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.6 ENVIRONMENTAL REQUIREMENTS

A. See section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

1.7 COORDINATION

A. See section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural Shapes, bars, plates: according to the General Structural Notes on the drawings.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Bolts, nuts, washers, and connectors: according to the General Structural Notes on the Drawings.

2.3 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 ACCESSORIES

A. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength as indicated in the General Structural Notes on the drawings.

B. Shop and Touch-Up Primer;
   1. Primer: SSPC-Paint 15 – Type `1, Red Oxide.

2.5 FABRICATION

A. Fabricate all steel in accordance with requirements of AISC specifications and "Code of Standard Practice for Steel Buildings and Bridges", and in accordance with details indicated on the structural drawings or as approved on shop drawings.

B. Space shear stud connectors at spacing indicated on the Drawings.

C. Continuously seal joined members as indicated on the drawings. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.6 FINISH

A. Prepare structural component surfaces in accordance with referenced standards.

B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Shop test bolted and welded connections as specified for field quality control tests.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

1. Complete as-built verification prior to fabrication to the greatest extent possible to allow minor corrections, where approved by the Architect and Structural Engineer, to be made prior to field installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish templates for installation of anchors and embedments in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads.

B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges".

C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure.

D. Field weld components and shear connectors indicted on Drawings.

E. Field connect members with threaded fasteners' torque to required resistance.

F. Do not use thermal cutting during erection unless approved by Architect and Structural Engineer.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 GROUT INSTALLATION

A. Grout under base plates and as otherwise shown.

B. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

C. Moist cure grout.

D. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45º.

E. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Refer to AISC Code of Standard Practice for Steel Buildings and Bridges.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting and testing.

B. Bolted Connections: Bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: In addition to visual inspection, field-welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. At the Owner’s option, the cost of additional testing performed to determine compliance of corrected work may be at the Contractor’s expense.

3.7 COATING REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded or damaged surfaces of galvanized items and apply galvanizing repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted members and accessories.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
   2. Apply compatible primer of same type as shop primer used on adjacent surfaces.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes shop fabricated metal items:
   1. Ladder for elevator pit.
   2. Two Ladders for roof penthouse access.

B. Section includes shop fabricated metal items for Site Work:
   1. Metal Bollards.

C. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 018113 for general requirements.

D. Project Specific Requirements: None.

E. Related Sections:
   1. Section 033000 - Cast-In-Place Concrete.
   2. Section 051200 - Structural Steel Framing.
   3. Section 099000 - Painting and Coating.
   4. General Structural Notes on the drawings.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Product Data:
   1. Paint products.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.3 QUALITY ASSURANCE

A. Finish joints in accordance with NOMMA Guideline 1.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00, to design ladders.

2.2 METALS

A. Steel sections, plates, bars and other rolled shapes: Refer to the General Structural Notes on the drawings. ASTM A36 / A36M.

B. Steel Pipe: ASTM A53, Type E or S, Grade B, Schedule 40.

C. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

D. Welding Materials: AWS D1.1; type required for materials being welded.

2.3 FASTENERS

A. General: refer to General Structural Notes

B. Material: unless otherwise indicated provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.
   1. Provide stainless steel fasteners for aluminum.

2.4 FABRICATION

A. Fabricate steel assemblies as indicated on drawings.

B. Fit and shop assemble items in largest practical sections, for delivery to site.

C. Fabricate items with joints tightly fitted and secured.

D. Continuously seal joined members by continuous welds.

E. 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.

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.5 FACTORY APPLIED FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Factory prime all steel items with one coat except:
   1. Do not prime surfaces in direct contact with concrete
   2. Do not prime surfaces where field welding is required.
   3. Do not prime surfaces where galvanizing is specified.

C. Galvanizing: Hot-dip galvanize all exterior metal fabrications to comply with ASTM A153/A 153M for steel and iron hardware and with ASTM A123/A 123M for other steel and iron products.

D. For steel fabrications with site painting indicated on the drawings, refer to Section 099000 - Painting and Coating.

E. Powder coat items indicated on the drawings:
   1. Powder coating, fluoropolymer
      a. Pencil Hardness ASTM D 3363: F, minimum.
      b. Salt Spray Resistance, ASTM B 117: 4,000 hours.
      c. Humidity Resistance, ASTM D 2247: 4,000 hours.
      d. Dry Film Thickness, ASTM D1400: 2 mil minimum thickness.
   2. Color: As selected from manufacturer’s full range.
   3. Gloss: Low, less than 20.
   4. Surface: Smooth.

2.6 FABRICATION TOLERANCES

A. Squareness: 1/8" maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16".

C. Maximum Misalignment of Adjacent Members: 1/16".

D. Maximum Bow: 1/8" in 48 inches.

E. Maximum Deviation From Plane: 1/16" in 48 inches.

2.7 BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.
   1. Cap bollards with ¼ inch thick steel plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.

C. Field weld components indicated on design drawings or shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval of Architect/Engineer prior to site cutting or making adjustments not scheduled.

F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4" per story or for every 12 ft in height whichever is greater, non-cumulative.

C. Maximum Offset From Alignment: 1/4".

D. Maximum Out-of-Position: 1/4".

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 015005.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Structural wood framing; wood sheathing; sound reducing floor underlayment; preservative treatment of wood; fire retardant treatment of wood; miscellaneous framing and sheathing; equipment back boards; and concealed wood blocking for support of toilet and bath accessories, wall cabinets, railings, equipment and wood trim.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
   2. Engineered wood to contain no added urea formaldehyde and must be certified compliant to CA 92120 Phase 2 per ESDS 6.1.

C. Project Specific Requirements:
   1. OSB is not acceptable for this project. Even if structural engineer includes OSB as an alternate in shear wall tables it is NOT to be installed.
   2. Sound reducing panels to be installed at second floor level at flats.

D. Related Sections:
   1. Section 06 17 33 - Wood I-Joists.
   2. Section 06 18 00 - Glue Laminated Construction.
   3. Section 06 20 00 - Finish Carpentry.
   4. Section 07 27 00 - Weather Resistive Barriers.
   5. Section 07 45 00 – Rainscreen Furring.
   6. Section 09 21 16 - Gypsum Board.
   7. General Structural Notes on the drawings.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. American Wood-Preservers' Association:
   1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
   2. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

C. American Society for Testing and Materials (ASTM):
   1. ASTM C209 – Test Methods for Cellulosic Fiber Insulating Board.

D. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

E. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

F. Western Wood Products Association: WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit technical data on wood preservative materials, and application instructions.
2. Moisture Readings: submit three copies of moisture content readings for framing materials enclosed in walls and roof framing.
3. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.

C. ESDS Binder:
1. Certification: All composite wood products exposed to interior must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2. See 01 81 13 – 1.6 C 12.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. Lumber Grading Agency: Certified by NIST PS 20.
2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.

B. Surface Burning Characteristics: Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material.

D. Mock up: per section 014000 - 1.5.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect framing and sheathing materials from excessive exposure to moisture.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Refer to General Structural Notes on the drawings for lumber species, size and spacing.

B. Lumber Grading Rules: WCLIB. Refer to the General Structural Notes on the drawings.

C. Beam, joist, purlin and stiffener roof framing: Refer to the General Structural Notes, 19% maximum moisture content.

D. Studding, plates, and misc. light framing: Refer to the General Structural Notes, 19% maximum moisture content.

E. Use pressure treated members where in contact with concrete or where indicated on the drawings.

2.2 SHEATHING AND UNDERLAYMENT MATERIALS

A. Refer to the General Structural Notes on the drawings.

B. Exterior wall and roof sheathing: APA-rated exterior glue, Exposure 1 in conformance with PS-1 and PS-2.

C. Interior Floor sheathing: Plywood.

D. Interior Shear Wall: APA-rated plywood per structural.

E. Oriented Strand Board is not an acceptable material.

F. Include blocking at locations adjacent to all bathtubs and all toilets where grab bars are installed or may be required to be installed in the future. See drawings for locations.

G. Telephone and electrical panel boards: ¾” plywood, CDX.

H. Exterior Gypsum Wall Sheathing: refer to Section 09 21 16.

2.3 FIREBLOCKING AND DRAFTSTOPPING

A. Fireblocking 1-hour Fire Rating: Solid lumber, structural wood panel, or particleboard.
   1. Solid lumber nominal 2 inches thick.
   2. Two layers of solid lumber nominal 1 inch thick with broken lapped joints (only allowed if approved by Building Inspector).

B. Fireblocking 2-hour Fire Rating: Solid lumber.
   1. Solid lumber nominal 4 inches thick.

C. Draftstopping for attic spaces: Gypsum board or plywood.
   1. Gypsum board, type ‘x’ 5/8 inch thick.
   2. Plywood, 3/8 inch thick.

2.4 ACCESSORIES

A. Fasteners and Anchors:
   1. As listed in the General Structural Notes on the drawings.

2. Fasteners: Hot dipped or Electro galvanized steel for high humidity, Z-Max or other special coating for treated wood locations, unfinished steel elsewhere.
3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

B. Structural Framing Connectors: refer to the General Structural Notes on the drawings.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width wide, closed cell polyethylene foam from continuous rolls.

D. Sheathing Glue: EWA AFG-01, waterproof of water base, air cure type, cartridge dispensed.

E. Weather Resistive Barrier: refer to Section 072700 - Air Barriers and Weather-Resistive Barriers.

2.5 FACTORY WOOD TREATMENT

A. Wood or Plywood: Water borne preservative treatment for lumber and plywood in conditions not subject to soil, weather, and/or continuous water contact to be sodium borate treatment, AWPA C31 for lumber and C9 for plywood.

B. Wood exposed to soil, weather and/or water: ACQ (Alkaline Copper Quat) or CA (Copper Azole) water borne preservative by Chemical Specialties, Inc. or alternate manufacturer approved by the Architect of arsenic and/or chromium free wood preservative. Recommended retention of 0.25 lb./cu. ft. for above ground applications, and 0.042 lb./cu. ft. for ground or concrete contact.

C. Moisture Content After Treatment: Kiln dried (KDAT).
1. Lumber: Maximum 19 percent.
2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members, crown side up.

D. Construct load bearing framing and curb members full length without splices.

E. Double members at openings as noted in the General Structural Notes on the drawings. Space short studs over and under opening to stud spacing.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions parallel to floor joists. Frame rigidly into joists.

G. Place sill gasket directly on concrete foundation. Puncture gasket clean and fit tight to protruding foundation anchor bolts.

H. Coordinate installation of plywood decking, glue laminated structural units, and wood joists/stiffeners.

I. Curb roof openings except where prefabricated curbs are provided. Construct curb members of solid wood sections. Form corners by alternating and lapping side members.

J. Coordinate curb installation with installation of decking and support of deck openings.

K. Submit manufacturer's certificates for wood roof framing exposed to view. Refer to Section 061000 (1.4).

3.2 SHEATHING

A. Install sheathing perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay sheathing with tongue upwards.

B. Engage plywood tongue and groove edges. Allow expansion space at edges and ends.

C. Attach sheathing with adhesive and fasteners per the General Structural Notes on the drawings.

D. Provide solid wood blocking at edges of sheets between supporting framing members.

E. Cut roof sheathing to accommodate roof drains and flanges.

3.3 SOUND ATTENUATION PANELS

A. Install in accordance with manufacturer’s written instructions.

B. Install only clean dry panels. Do not install wet panels.

C. Floor Panels: space panel joints 3/16 inch apart, 3/8 inch space at walls and partitions. Stagger joints.

3.4 FIREBLOCKING AND DRAFTSTOPPING

A. Install fireblocking to cut off concealed draft openings.
   1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally at maximum 10 feet on center.
   2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
      a. Horizontal floor and roof framing.
      b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.

3.5 SITE APPLIED WOOD TREATMENT

A. Brush-apply two coats of preservative treatment on pressure-treated wood subject to site-sawn cuts.

B. Allow preservative to dry prior to erecting members.

3.6 QUALITY ASSURANCE

A. Moisture Content: take moisture readings of lumber and plywood prior to enclosure in wall and ceiling assemblies. Submit to Architect per (1.04).

3.7 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Framing Members: 1/4" from indicated position, maximum.

C. Surface Flatness of Floor: 1/4” in 10 feet maximum, and 1/2" in 30 feet maximum.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 015005.

END OF SECTION

SECTION 06 17 33

WOOD I-JOISTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Engineered wood chord and web joists for roof and floor framing; bridging, bracing and anchorage, and framing for openings.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Engineered lumber must contain no added urea formaldehyde per ESDS 6.1.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. General Structural Notes on the drawings.

1.2 REFERENCES

A. APA-The Engineered Wood Association: APA/EWA TB 200 - Fire Retardant Treated Plywood.

B. American Wood-Preservers' Association: AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.

C. ASTM International:
   1. ASTM D2559 - Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.
   2. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
   3. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate sizes and spacing of joists, fastener description and spacing, loads, and framed opening details. Indicate manufacturer's criteria for size and location of penetrations through the web members.
   2. Product Data: Submit joist configurations, bearing and anchor details, and bridging and bracing details.

3. Product data: Certification that the engineered wood contains no added urea formaldehyde per ESDS 6.1. See specification section 01 81 13 – 1.6 C 12.
4. Assembly Tests: Submit data on proprietary floor/ceiling assemblies. Coordinate with Sections 09 21 16 and 03 54 00. Data must show compliance with fire rating and acoustic requirements.
5. VOC information: Include manufacturer's information for each product, adhesive, coating and sealant used in this Section identifying VOC limits and chemical components per specification section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. I-Joist Quality Assurance Agency.
   2. General Structural Notes on the drawings.

B. Joist Structural Capacities: Determine in accordance with ASTM D5055.

C. Joists detailed and installed in accordance with current National Evaluation Report or ICC Evaluation Service Report.

D. Fire Rated Floor and Roof Construction: Rating as indicated on Drawings.

E. Qualifications
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
   2. Design joists and associated components under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Washington.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect structural components from warping or other distortion by stacking in vertical position, braced to resist movement.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

2.1 PLYWOOD I JOISTS

A. Manufacturers:

1. Georgia Pacific Corp.
2. Louisiana-Pacific Corp.
3. TrusJoist MacMillan.
4. Weyerhaeuser Engineered Stand Products.
5. Boise Cascade LLC.
6. As otherwise listed in the General Structural Notes on the drawings.
7. Substitutions: Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Comply with the materials and sizes shown on the Structural drawings and in the General Structural Notes.

B. All materials must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2.

2.3 ACCESSORIES

A. Adhesive: ASTM D2559, waterproof.

B. Fasteners and Anchors: Refer to Section 06 10 00 - Rough Carpentry.

2.4 FABRICATION

A. Fabricate joists to achieve structural requirements specified.

B. Brace members for support during transit.

C. Fabricate bottom and/or top chord extensions as indicated on Drawings.

D. Frame special sized openings in web as indicated on Drawings.

E. Engineered wood should contain no added urea formaldehyde

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents. Specified shop inspections are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify supports and openings are ready to receive joists.

3.2 PREPARATION

A. Coordinate placement of bearing and/or support items.

3.3 ERECTION

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in alignment until completion of erection and installation of permanent bracing.

C. Do not field cut or alter structural members without approval of Architect/Engineer.

D. Place headers and supports to frame openings.

E. Frame openings between joists with lumber in [accordance with Section 06 10 00 and the structural drawings.

F. Coordinate placement of decking and/or sheathing with Work of this section.

3.4 SITE APPLIED WOOD TREATMENT

A. Refer to Section 06 10 00 - Rough Carpentry.

3.5 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Framing Members: 1/2 inch maximum, from indicated position.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes for Armory: N/A

B. Section includes for new townhomes and apartments:
   1. Glued laminated timber beams and steel connections.

C. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Engineered lumber must contain no added urea formaldehyde per ESDS 6.1.

D. Project Specific Requirements:
   1. None.

E. Related Sections:
   1. Section 05 50 00 - Metal Fabrications.
   2. Section 06 10 00 - Rough Carpentry.
   3. Section 09 90 00 - Painting and Coating.
   4. General Structural Notes on the drawings.

1.2 REFERENCES

A. American Institute of Timber Construction:
   1. AITC A190.1 - Wood Products - Structural Glued Laminated Timber.

B. ASTM International:
   1. ASTM D2559 - Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.

C. American Wood-Preservers' Association:
   1. AWPA C28 - Standard for Preservative Treatment of Structural Glued Laminated Members and Lamination Before Gluing of Southern Pine, Coastal Douglas Fir, Hemfir and Western Hemlock by Pressure Processes.

D. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing.

2. Product Data: Submit beam configurations, bearing and anchor details, and bridging and bracing details. Product data must certify that the engineered wood contains no added urea formaldehyde
3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.
4. Product Data: Certification that product contains no added urea formaldehyde per ESDS 6.1. See specification section 01 81 13 – 1.6 C 12.

C. Informational Submittal:
1. Environmental Product Declaration if available.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material.

C. Qualifications:
1. Manufacturer/Fabricator: Company specializing in manufacture of glue laminated structural units with minimum three years experience, and certified by AITC in accordance with ANSI A190.1
2. Erector: Company specializing in erection of this Work with minimum three years documented experience.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. One year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect members to AITC or APA/EWS requirements for individually wrapped units.

C. Leave individual wrapping in place until finishing occurs.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:

1. Manufacturer must be an AITC licensed firm qualified to apply the AITC "Quality Inspected" mark.
2. Grade Mark: All glued-laminated units shall bear the AITC "Quality Inspected" grademark including product grade and name of manufacturer.

B. Materials: according to the General Structural Notes on the drawings.

C. Materials must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2.

2.2 FABRICATION

A. Fabricate glue laminated structural members in accordance with AITC or APA/EWS.

B. Verify dimensions and site conditions prior to fabrication.

C. Cut and fit members accurately to length to achieve tight joint fit.

D. Camber: according to the General Structural Notes on the drawings.

E. Do not splice or join members in locations other than those indicated without permission.

F. Protection: opaque, weather-resistant wrapping applied at the manufacturing facility, and left in place until adjacent finishes have been applied in the field.

G. After end trimming, do not seal.

H. Field Finishing of Members: Specified in Section 09 90 00 - Painting and Coating.

I. Engineered wood should contain no added urea formaldehyde

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify supports are ready to receive units.

C. Verify sufficient end bearing area.

3.2 PREPARATION

A. Coordinate placement of bearing/support items.

3.3 ERECTION

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

C. Install temporary bracing and anchorage to hold members in place until permanently secured. Make no holes or markings that will be visible in the finished work.

D. Fit members together accurately without trimming, cutting, or other unauthorized modification.

E. Keep protective wrapping in place until adjacent finishes have been applied.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Framing Members: 1/2" maximum from indicated position.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Interior finish carpentry items: standing and running wood trim.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Engineered wood must contain no added urea formaldehyde and must be certified compliant to CA 92120 Phase 2 per ESDS 6.1.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 06 61 00 - Plastic Laminate Fabrications.
   3. Section 08 14 16 - Flush Wood Doors.
   4. Section 08 14 33 - Stile and Rail Wood Doors.
   5. Section 08 71 00 - Door Hardware.
   6. Section 12 35 30 - Residential Casework.

1.2 REFERENCES

A. APA-The Engineered Wood Association: APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

B. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. Architectural Woodwork Institute: AWI - Quality Standards Illustrated.

D. Hardwood Plywood and Veneer Association: HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

E. National Fire Protection Association:
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
   2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

F. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:

1. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories, to minimum scale of 1-1/2 inch to 1 ft.
2. Product Data:
   a. Submit data on fire retardant treatment materials and application instructions.
   b. Submit data on attachment hardware, and finish hardware.
3. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.
4. Samples:
   a. Submit three samples of wood trim 10 inch long.
   b. Submit three samples each of prefinished paneling, hardware items, and shop finishes.

C. ESDS Binder:
   1. Certification: All composite wood products exposed to interior must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2. See specification section 01 81 13 – 1.6 C 12.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with AWI (Architectural Woodwork Institute), Custom Grade for opaque/painted finishes, and Premium Grade for transparent finishes.

B. Base and trim to be supplied by single manufacturer unless approved by Architect.

C. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

D. Qualifications:
   1. Fabricator: Company or individual specializing in fabricating Products specified in this section with minimum three years documented experience.
   2. Installer: Certified participant in AWI's Quality Certification Program.

1.5 WARRANTY

A. One year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect work from moisture damage.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

2.1 GENERAL

A. Moisture content of finish woods not more than 9% when delivered to the building.

B. Surface quality of the wood: Contractor shall take care in selecting the best face and edge of each piece, and consider its use and location. Materials shall have no visible milling or planing marks.

2.2 MATERIALS

A. Interior Paint Grade Wood: poplar or hemlock conforming to ANSI/HPHA HP-1 Grade C, uniform, closed grain, plain sawn.
   1. Finished wood must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2.

B. Schedule:
   1. 1 x 3 trim at all interior unit doors with wood frames.
   2. 1 x 4 trim at all common room doors with wood frames.
   3. 5/4” wood cap at partial height walls.
   4. Wood handrails at stairs.
   5. 1x4 stools at all exterior windows.

C. Adhesive for woods:
   1. Interior woodwork: Low-VOC FS MMM-A-125C, Type II, water and mold resistant. Use ASTM D 3110 dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations, water-based contact cement and water-based construction adhesive.

2.3 ACCESSORIES

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

B. Concealed Joint Fasteners: Threaded steel.

C. Primer for painted surfaces: Latex primer sealer type, Low-VOC. Refer to Section 09 90 00.

D. Wood Filler: Low VOC, tinted to match surface finish color.

E. Handrail Brackets: ANSI/BHMA A156.16, finish to match other finish hardware. Matching wood screws, minimum 2 per bracket.

2.4 FABRICATION

A. Fabricate to AWI Custom or Premium standards per Quality Assurance provisions above.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

D. Engineered wood should contain no added urea formaldehyde.

2.5 SHOP FINISHING

A. Sand work smooth and set exposed fasteners.

B. Apply wood filler in exposed fastener indentations.

C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with Section 09 93 00 for transparent and opaque finishes as noted on the drawings.

E. Seal, and finish exposed to view surfaces.

F. Seal internal surfaces and semi-concealed surfaces.

G. Prime paint or seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI Custom and Premium quality standard as noted in Quality Assurance provisions above. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

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

C. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long except where shorter single-length pieces are necessary.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

E. Install interior wood trim with nails at 16 inches on center. Set nail heads and follow with putty to flush with surface. Carefully select the color of the putty to match the background color of the wood. Architect to approve putty color.

F. Eased Edges: ease exposed edges of the finish work 1/32” minimum radius or as indicated on drawings. Non-eased edges and corners not accepted.

G. Preparation For Site Finishing (opaque):
   1. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
   2. Site Finishing: Refer to Section 09 90 00.
   3. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Indicated Position: 1/16 inch.

C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 06 61 00

PLASTIC LAMINATE FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Custom-fabricated plastic laminate wall coverings at kitchens between countertop base and upper cabinets.
   2. Custom-fabricated plastic laminate wall coverings at common bathrooms and laundry rooms.
   3. Plastic Laminate pipe protection panels in sink bases in Type A accessible units and common rooms.
   4. If deductive alternate #1 is chosen by owner include custom fabricated plastic laminate countertops in residential units and common areas.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Plastic laminate counter tops and plastic laminate wall coverings to meet the requirements of ESDS 7.10.
   3. Engineered lumber must contain no added urea formaldehyde per ESDS 6.1.

C. Project Specific Requirements:
   1. Provide Plastic Laminate pipe protection panels at sink bases as shown on drawings.
   2. See Alternates number 1 in section 01 20 00-1.7 F 1. Replace Solid Surface countertop with Plastic Laminate countertop and backsplash if deductive alternate is chosen.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 06 20 00 - Finish Carpentry.
   3. Section 09 72 00 - Wall Coverings (FRP).
   4. Section 12 35 30 - Residential Casework.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. ASTM International: ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. National Electrical Manufacturers Association: NEMA LD 3 - High Pressure Decorative Laminates.

D. National Fire Protection Association:
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

E. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
2. Samples: Submit four 4 x 4 inch size samples of selected plastic laminate for each application (countertops, tub surrounds).

C. ESDS Binder:
1. Include manufacturer's product information for countertops and wall protection under Criterion 7.10 per Section 01 81 13 – 1.6 C 20.
2. VOC Content: Provide printed statement of VOC content for installation adhesives and site-applied paints and sealants per Section 01 81 13 – 1.6 C 12. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with AWI (Architectural Woodwork Institute) Architectural Woodwork Quality Standards Illustrated, Custom Grade.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Field measure prior to fabrication.

D. Qualifications:
1. Fabricator and Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 WARRANTY

A. One year standard warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect units from moisture damage.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Plam openings with sink and faucet requirements.

C. Coordinate Plam locations with residential cabinetry.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: Formica Corp. 10155 Reading Road, Cincinnati, OH 45241.

2.2 COMPONENTS FOR PLAM WALL COVERINGS

A. Standard Decorative Plastic Laminate: NEMA LD 3, GP28 for vertical surfaces, PF42 for post forming; pattern and surface texture as selected by Architect.

B. Adhesive for High Pressure Decorative Laminates: contact adhesive, type recommended by laminate manufacturer to suit application, Low-VOC certified in accordance with ASTM C557, required VOC regulations and section 01 81 13.

C. Color:
1. By Architect, selection to be from manufactures full standard color range.

D. Termination Trim:
1. Common spaces: SS edge banding, 0.12 inch thick, matching laminate in color, pattern and finish.

E. Fabrication:
1. Fabricated from single sheet of plastic laminate; dimension verified in field.
2. Provide cut outs for outlets, wall switches, louvers and other equipment as required and indicated.
3. Fabricate for true plumb, horizontal and parallel installation.

2.3 COMPONENTS FOR EXTENDED BACKSPLASH IN UNIT KITCHENS

A. Standard Decorative Plastic Laminate: NEMA LD 3, GP28 for vertical surfaces, PF42 for post forming; pattern and surface texture as selected by Architect.

B. Adhesive for High Pressure Decorative Laminates: contact adhesive, type recommended by laminate manufacturer to suit application, Low-VOC certified in accordance with ASTM C557, required VOC regulations and section 01 81 13.

C. Extended back splash: In residential units, plastic laminate wall covering above kitchen backsplash to bottom of upper cabinets per elevation.

D. Color:
1. By Architect, selection to be from manufactures full standard color range.

E. Termination Trim:
1. Common spaces: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern and finish.

E. Fabrication:
1. Fabricated from single sheet of plastic laminate; dimension verified in field.
2. Provide cut outs for outlets and switches as required and indicated.

3. Fabricate for true plumb, horizontal and parallel installation.

2.4 COMPONENTS FOR PLAM COUNTERTOPS PER DEDUCTIVE ALTERNATE #1

A. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, PF42 for post forming; pattern and surface texture as selected by Architect. Allow for two colors in residential units, an additional color at common rooms.

B. Plastic Laminate countertops in common rooms: post-formed over particleboard core, urea formaldehyde-free, square intersection to back splash and at top of backsplash, square front edge.

C. Plastic Laminate countertops in residential units: post-formed over particleboard core, urea formaldehyde-free, coved intersection to back splash and at top of backsplash, waterfall front edge (no seams between top of backsplash to bottom of front edge).

D. Side splash: Plastic laminate over particleboard core (same as above), adhesive-set to countertop surface and main backsplash in square intersections, coved top edge scribed to main backsplash for a tight fit. Seal square intersections with clear silicone sealant for neat appearance.

E. Adhesive for High Pressure Decorative Laminates: contact adhesive, type recommended by laminate manufacturer to suit application, Low-VOC certified in accordance with ASTM C557, required VOC regulations and section 01 81 13.

F. Termination Trim: PVC at edges and butt joints, smooth finish, color selected by Architect.

G. Color:
1. By Architect, selection to be from manufactures full standard color range.

2.5 COMPONENTS FOR PLAM PIPE PROTECTION PANEL

A. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, PF42 for post forming; pattern and surface texture as selected by Architect. Allow for one color in residential units, an additional color at common rooms.

B. Plastic Laminate pipe protection panels: post-formed over particleboard core, urea formaldehyde-free.

C. Adhesive for High Pressure Decorative Laminates: contact adhesive, type recommended by laminate manufacturer to suit application, Low-VOC certified in accordance with ASTM C557, required VOC regulations and section 01 81 13.

D. Termination Trim: PVC at edges and butt joints, smooth finish, color selected by Architect.

E. Location: as shown in architectural drawings. See 10/G064.

F. Color:
1. By Architect, selection to be from manufactures full standard color range.

2.6 FABRICATION

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

B. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

C. Apply high-pressure decorative laminate in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum two feet from sink cutouts.

D. Fabricate counter tops with cutouts for plumbing fixtures, inserts, appliances, and outlet boxes. Verify locations of cutouts from on-site dimensions. Where countertop is cut for slide-in appliances, apply plastic laminate strip of same color/pattern to the cut edge.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify adequacy of backing and support framing.

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

3.2 INSTALLATION

A. Use fixture attachments in concealed locations for wall mounted components.

B. Use concealed joint fasteners to align and secure adjoining counter tops.

C. Carefully scribe countertops and tub surrounds abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Attach countertops securely to base cabinets with adhesive and concealed screws to cabinet corner stiffeners. Where joining adjacent sections or at corner miters, apply adhesive to both faces and draw sections together using 3" minimum draw bolts recessed into routed slot in underside.

3.3 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

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

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 06 61 16

SOLID SURFACE FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Additive Alternate for Quartz countertops and backsplash for residential apartments per 01 20 00-1.7F1.
   2. Additive Alternate for Quartz countertops and backsplash for common rooms and offices per 01 20 00 – 1.7F2.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Solid surface counter tops to meet the requirements of ESDS 7.10.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 07 90 00 - Joint Protection: Perimeter sealant to adjacent construction.
   2. Section 12 35 30 - Residential Casework: Cabinets with cast plastic counter top and backsplash.
   3. Section 22 40 00 - Plumbing Fixtures

1.2 REFERENCES

A. ASTM International:

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

C. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

D. Underwriters Laboratories Inc.:
   1. UL - Fire Resistance Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, and anchorages.
   2. Product Data: Submit data on specified products.

3. Samples: Submit two samples representative of counter top, 3x3 inch in size illustrating color, texture, and finish.

C. Closeout Submittals:
1. Section 01 70 00 - Execution and Closeout: Closeout procedures.
2. Operation and Maintenance Data: Submit list of approved cleaning materials and procedures required; list of substances harmful to component materials. Include instructions for stain removal, surface and gloss restoration.

1.4 QUALITY ASSURANCE

A. Developed index when tested in accordance with ASTM E84.

B. Field measure prior to fabrication.

C. Qualifications:
1. Fabricator and Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 WARRANTY

A. Ten-year manufacturer’s warranty on products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.1 QUARTZ FABRICATIONS

A. Fabricators:
1. Madrona Stone.
2. Substitutions: Section 01 60 00 - Product Requirements

2.2 COMPONENTS

A. Madrona Stone 2cm Quartz.
1. 93 percent quartz aggregate combined with polyester resin binders fabricated into slab.

2.3 FABRICATION

A. Horizontal Surfaces: 2 cm solid surface countertop to size and shape, with square edge. Integral 4” backsplash.

B. Shape: Straight, slightly eased at top (1/4” radius).

2.4 ACCESSORIES

A. Sealants: 100% silicone and matched to finished color.

B. Adhesives: 100% silicone and matched to finished color.

C. Sink mounting hardware: provide hardware for mounting sinks per manufacturer.

2.5 SHOP FINISHING

A. Color: color as selected by Architect from Group 0 and Group 1 colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

A. Provide anchoring devices for installation.

B. Provide templates and rough-in measurements.

3.3 FABRICATION

A. Fabrication shall be performed by an ISFA accredited fabricator or who has demonstrated proficiency in the types of work required by this project.

B. Shop fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.

C. Fabricate in one piece with shop-applied edges u.n.o.

D. Form seams between components, unless otherwise indicated, using solid surface manufacturer's standard seam adhesive. Adhesive shall be color coordinated to match solid surface material color and shall form inconspicuous seams.

E. Provide cutouts for plumbing fittings and bath accessories as indicated on the drawings and as recommended by the equipment and solid surface manufacturer

3.4 INSTALLATION

A. Pre-fit finish material in place. Scribe material as required to provide proper fit with adjacent materials.

B. Provide additional support for material seams in both horizontal and vertical locations. Separation/release paper shall be provided between all supports and seams to prevent direct adhering of finish material tosubstrate.

C. Form field joints using manufacturer's recommended adhesive, with inconspicuous joints in finished work.

D. Sink and bowl installation: Adhere flush mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.

E. Provide backsplashes and sidesplashes as indicated on the drawings. Adhere backsplashes and sidesplashes to countertops using manufacturer's recommended adhesive.

F. Provide support for overhangs per manufacturer's written instructions.

3.5 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Indicated Dimension: 1/8 inch.

3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

3.7 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 11 00

DAMPPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Cold applied water based dampproofing for application on below-grade foundation walls and footings at concrete site walls where indicated on drawings. Specific locations include:
      a. Building perimeter footings and stem walls.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 - Cast-In-Place Concrete.
   3. Section 07 13 00 - Sheet Waterproofing.
   4. Section 07 17 00 - Bentonite Waterproofing.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D 2939 – 1998 Section 15, Method A – Resistance to water.
   2. ASTM D 6489 – 1998 Water Absorption.
   3. ASTM D449 - Standard Specification for Asphalt Used in Damproofing and Waterproofing.
   4. ASTM C 836 – 2000 Film thickness on vertical suface.
   5. ASTM D 2665 – 1999 Color Fastness of surface coating – UV resistance.
   6. ASTM D 3273 – 94 Resistance to mold growth of surface coating.

B. National Roofing Contractors Association: NRCA - The NRCA Waterproofing and Dampproofing Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit properties of primer, bitumen, and mastics.
   2. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. 01 40 00 – Quality Requirements.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until membrane has cured.

PART 2 PRODUCTS

2.1 WATER BASED DAMPPROOFING

A. Manufacturers:
   1. DECO 20 Dampproof Coating, DECO Products, Inc.
   2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. DECO 20 Dampproof Coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify items penetrating surfaces to receive dampproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer or applicator.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 INSTALLATION

A. Install dampproofing in accordance with manufacturer’s written instructions.

B. Prime surfaces if required by manufacturer, or wet surfaces as recommended by manufacturer. If primed, permit primer to dry.

C. Apply product directly from container by brush, roller or spray using proper equipment. Apply two coats, allowing first coat to dry tacky before applying second coat.

D. Fill in all crevices and grooves, making sure coating is continuous and free from breaks and pinholes. Carry coating over exposed top and outside edge of footing. Spread around all joints, grooves and slots and into all chases, corners, reveals and the like. Bring the coating to finished grade.

E. Seal items Projecting through damproofing surface with mastic. Seal watertight.

F. Backfilling: place backfill no sooner than seven days after application of damproofing, unless specifically allowed otherwise by manufacturer. Do not rupture or damage the film or displace the coating.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 17 00

BENTONITE SHEET WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Work includes:
   1. Provide bentonite waterproofing system, drainage mat and water stops (at concrete cold joints) capable of preventing the passage of liquid water at locations as indicated on the Architectural Drawings.
   2. Waterproofing indicated as Bentonite Panel Waterproof Membrane in the drawings.
   3. Locations include elevator pit.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Division 03 – Cast-in-Place Concrete

1.2 REFERENCES

A. ASTM D3776M – Standard Test Methods for Mass Per Unit Area (Weight) of Fabric

B. ASTM D5084 – Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

C. ASTM D5385 – Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Action submittals:
   1. Product Data: Submit manufacturer’s Technical Data Sheets (TDS) for each product to be installed.
   2. Installation Instructions: Submit manufacturer’s published installation instructions and specifications for system(s) to be installed.
   3. Material Certificates: Submit certificate(s) signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements. Submit certification that waterproofing system and components, drainage and protection materials are supplied by a single-source manufacturer.
   4. Contractor Certificate: Submit written certification that installer is an approved applicator for the specified system. Certificate shall be signed by an officer of the system manufacturer on corporate letterhead.

5. Shop Drawings: Provide shop drawings indicating standard and non-standard manufacturer's details to be used. Also show intended extent of waterproofing installation.
6. Sample Warranty: Submit sample warranty indicating the following:
   a. Address of installation, installed system, warranty period, certified installer and date of substantial completion (field blank).

C. Informative submittals
1. VOC information: Include EPD sheets for each product, adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. Note ESDS compliance not required for products outside of the air barrier.

1.4 QUALITY ASSURANCE

A. 01 40 00 – Quality Requirements.

B. Installer Qualifications: Installer shall have at least 3 years' experience in work of the type required by this Section, who can comply with manufacturer's warranty requirements, and who is an Approved Applicator as determined by waterproofing/drainage system manufacturer.

C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field installation, to establish procedures to maintain required working conditions and coordinate the Work with related and adjacent work. Verify that final waterproofing details comply with waterproofing manufacturer's current installation requirements and recommendations.

D. Materials: Bentonite geotextile waterproofing system and related accessories shall originate from a single source to assure material compatibility, and system warrantability.

E. Inspection: Manufacturer's Representative shall inspect waterproofing installation periodically during application, to verify that waterproofing has been installed in accordance with manufacturer's guidelines and recommendations.

F. Water Sample Test: Project site water sample that waterproofing contractor supplies to manufacturer, to determine type of bentonite system (standard sodium bentonite or contaminate-resistant sodium bentonite) to be utilized on the Project.
1. Manufacturer shall conduct test free of charge. Contractor is responsible for collection and shipment of 1 liter of actual site water.

1.5 WARRANTY

A. Waterproofing Warranty: Upon completion and acceptance of the Work required by this Section, the waterproofing materials manufacturer will provide a written 5-year system warranty covering materials and labor. Issuance of Manufacturer's System Warranty requires the following:
1. Manufacturer's Approved Applicator to install bentonite waterproofing products and prefabricated drainage composite.
2. Bentonite water stops must be installed in all applicable horizontal and vertical cold pour concrete construction joints.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Deliver materials in factory-sealed and labeled packaging. Sequence deliveries to avoid delays and minimize on-site storage. Handle and store following manufacturer's instructions, recommendations, and material safety data sheets (MDS). Protect from construction operation-related damage and damage from weather, excessive temperatures, and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Storage: Do not double-stack pallets during shipping or storage. Protect waterproofing materials from moisture, excessive temperatures, and sources of ignition. Provide cover, top and all sides, for materials stored on site, allowing for adequate ventilation.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Substrate Condition: Proceed with the Work only when substrate construction and preparation work is complete and in condition to receive waterproofing system.

B. Weather Conditions: Perform the Work only when existing and forecasted weather conditions are within guidelines established by the manufacturer of waterproofing materials. Do not apply waterproofing materials into standing or ponding water conditions.

PART 2 PRODUCTS

2.1 BELOW-GRADE WATERPROOFING MEMBRANE

A. Membrane Assembly: Minimum 4'-wide roll of interlocked geotextiles encapsulating a minimum 1.10-lb per square foot of granular sodium bentonite. Composite shall consist of 1 woven and one 1-woven polypropylene geotextile, interlocked using a needle-punching process that produces several interlocks per square inch over area of membrane. Product shall have an integrated polymeric sheet liner on 1 side.
   1. Sodium Bentonite: Specially selected Wyoming granular bentonite containing approximately 90% montmorillonite with 10% maximum unaltered volcanic ash and other native sediments.
   2. Free Swell Rating: 2 grams sifted into deionised water swells to occupy a minimum volume of 16 cc.
   3. Grading: Granular bentonite passes 90% through a 20-mesh sieve and less than 10% through a 200-mesh sieve.

B. Pre-Approved Product:
   1. Voltex DS by CETCO
   2. Approved equivalent

2.2 WATERSTOP

A. Description: Select blend of sodium bentonite and butyl rubber compound formed into uniform coils for use as waterstop agent at cold joints in cast-in-place concrete construction.
   1. Waterstop RX-101 by Cetco
   2. Approved equivalent

B. Waterstop at concrete less than 8" in thickness:
   1. Waterstop RX-102 by Cetco
   2. Approved equivalent

2.3 SHEET DRAINAGE COURSE

A. Aquadrain 8mm by CETCO
   1. HPDE drainage composite with non-woven geotextile fabric.

2.4 BENTONITE MASTIC

A. Description: Trowel-grade sodium bentonite compound used as detailing mastic around penetrations, corner transitions and grade terminations.
   1. Volclay Bentoseal by Cetco
   2. Approved equivalent

2.5 SODIUM BENTONITE TUBES:

A. Description: 2"-diameter x 2'0"-long, water-soluble tube container filled with granular sodium bentonite for use at locations as shown on the project documents.
   1. Volclay Hydrobar tubes
   2. Approved equivalent

2.6 ACCESSORIES

A. Primer: Solvent based, as recommended by manufacturer to adhere adhesive membrane to structural substrate.
   1. Enviroprimer SB by Cetco

B. Mastic: A trowel-grade mastic waterproofing designed for application as interfaces as recommended by manufacturer.
   1. M-2000 Liquid Flashing by Cetco

B. Pipe Penetrations:

   1. Bentoseal Collar.

   2. Volex Collar at pipe penetrations.

C. Tie-backs:

   1. CETCO pre-formed Tie Back Boot.

D. Grade terminations:

   1. Envirosheet Grade Flashing.

PART 3 EXECUTION

3.1 GENERAL

A. Install all products and components in strict accordance with manufacturer’s installation recommendations.

3.2 INSPECTION

A. The Installer shall examine conditions of substrates and other conditions under which the Work of this Section is to be performed, and notify the Contractor in writing of circumstances detrimental to proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected and acceptable for compliance with manufacturer's warranty requirements.

B. Commencement of system installation signifies that the Installer has deemed project conditions appropriate for warrantable installation of the below-grade waterproofing system.

3.3 SURFACE PREPARATION – MEMBRANE INSTALLATION ON GRADE

A. General: Prior to installation of membrane, ensure substrates meet manufacturer's requirements for a warrantable installation. Membrane shall be installed on well leveled soils without voids and debris.

B. Soil Density: Minimum compaction shall be no less than 85% Modified Proctor density for uniform support and containment of waterproofing sheets. If substrate consists of large aggregate, provide high-strength geotextile and compacted soil or sand for uniform support and containment of sheets.

C. Rat Slab: Provide minimum 4" rat slab as recommended by manufacturer to form substrate for membrane waterproofing application. Rat slab shall be reinforced as recommended by manufacturer to limit cracking to within membrane tolerances.

3.4 SURFACE PREPARATION – CONCRETE SUBSTRATES

A. General: Prior to installation of membrane, ensure substrates meet manufacturer's requirements for a warrantable installation. Concrete to receive waterproofing shall be of sound structural grade with a smooth finish, and free of debris, oil, grease, laitance, dirt, dust or other foreign matter that will impair the waterproofing and drainage system's performance.

B. Concrete Type: Install membrane over structural concrete only. Lightweight concrete is not a suitable substrate.

C. Concrete Cure Requirements: Membrane can be installed onto green structural concrete as soon as formwork is removed.

3.5 INSTALLATION GUIDELINES – GENERAL

A. Install membrane system in strict conformance with manufacturer's published installation instructions.

B. Membrane shall be installed with woven (dark gray) geotextile liner facing concrete to be waterproofed.

C. Prevent bentonite waterproofing products from hydrating before material is contained with concrete (blind-side application) or backfill (positive-side application). When threat of rain is imminent, installed bentonite products not already contained by overburden or backfill shall be covered with polyethylene sheeting to decrease chance of hydration. Remove polyethylene prior to overburden or backfill operations.

3.6 BACKFILLED CAST-IN-PLACE CONCRETE WALLS – “POSITIVE-SIDE” INSTALLATION

A. Install membrane in strict conformance with manufacturer’s published instructions. Place Hydrobar tubes along wall/footing intersection with ends butted together to form a continuous installation.

B. Trowel 3/4"-thick mastic fillet at inside corner transitions.

C. Starting at footing, install membrane horizontally (dark gray woven geotextile against the wall) covering Hydrobar tubes and extending out horizontally. Membrane shall lap over and down face of footing minimum 6".

D. Fasten membrane with washer-headed mechanical fasteners centered 24" around the edge. Stagger all vertical overlap seams a minimum of 24".

E. Detail around penetrations with 3/4" cant of mastic. Extend mastic 1/4" thick over substrate a minimum radius of 6" around penetration. Cut membrane snug around penetrations.

F. Terminate at both grade and footing with metal termination bar fastened 12" on center. Cover edges with minimum 1/2"-thick, 2"-wide layer of mastic.

G. Inspect finished membrane installation and repair damaged material prior to backfill placement. Assure membrane is not displaced during backfill placement or soil compaction.

3.7 DRAINAGE COURSE INSTALLATION

A. Install drainage course in strict conformance with manufacturer’s installation instructions. Order of installation varies between positive and blind-side application methods.

B. Starting at base of wall, place Aquadrain horizontally (plastic core side against membrane – positive side) or retaining substrate (blind side). Install flagged core side up. Use construction adhesive or washer head mechanical fasteners to secure drainage course.

C. Connect adjacent panels at the end, by pulling filter fabric back to expose 2 rows of core dimples and interlocking core dimples with the installed panel. With the next course, the flangeless panel edge shall be placed over the top flange edge of the panel below and butted dimple to dimple.

D. Connections shall be completed in shingle fashion so water will flow with the overlap and not against it. Overlap fabric in direction of water flow and secure with construction adhesive. Wrap panel termination edges with filter fabric flap by tucking it behind the plastic core.

3.8 BACKFILL AND CONCRETE PLACEMENT OPERATIONS:

A. Closely coordinate membrane installation with backfill or concrete activities. Specific care shall be undertaken during backfilling operations to avoid damage to waterproofing system.

B. Workers shall follow industry-accepted method for backfilling against membrane waterproofing, prohibiting the inclusion of large debris and boulders that could tear or otherwise damage the waterproofing system. Backfill shall be added in no more than 12" lifts and compacted per Project Documents.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 21 13

BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Rigid board insulation at underside of floor slab on grade, and at exterior curb walls in locations and in thicknesses as indicated on the drawings.

B. Performance Requirement:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
   2. Insulation to provide thermal resistance required by the current version of the Washington State Energy Code.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 07 21 16 - Blanket Insulation.
   2. Section 07 26 00 - Vapor Barriers and Vapor Retarders.
   3. Section 07 53 03 - Elastomeric Membrane Roofing: Rigid insulation at roof system.
   4. Section 07 21 19 - Foam Insulation.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
   2. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
   3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   5. ASTM C1289 - Standard Specification for Faced Rigid Cellular Thermal Insulation Board.
   6. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
   7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   8. ASTM E970 - Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

B. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit data on product characteristics, performance criteria, thermal performance, limitations, and adhesives.
   2. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation.

C. ESDS Binder:
   1. Include manufacturer’s product information showing compliance with VOC limits under Criterions 6.1 per spec section 01 81 13 – 1.6 C 12. See 01 33 00 – 1.2H for submittal requirements.

1.4 QUALITY ASSURANCE

A. Pre-installation conference and materials assembly:
   1. General Contractor will make provisions for a pre-installation conference for all products and trades included in the assembly of the exterior wall system per 01 40 00.

B. Mock up: per section 01 40 00.
   1. The subcontractor responsible for the work of this section to supply materials required for mock up.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install according to manufacturer’s written instructions.

B. Install when ambient temperature, humidity, and other environmental conditions are within range allowed by manufacturer.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Listed manufacturer: Owens Corning.

B. Other manufacturers:
   1. Dow Chemical Co.
   2. Johns-Manville.
   3. Certainteed Corporation.

4. Celotex Corporation.

2.2 COMPONENTS

A. Extruded Polystyrene Insulation at exterior wall: Foamular 150 extruded polystyrene insulation, cellular type, conforming to the following:
   1. Board Size: 24" x 96".
   2. Board Thickness: as required or noted on drawings.
   3. Thermal Resistance ASTM C518: R-5 per inch thickness.
   4. Water Absorption: In accordance with ASTM C272, .10 percent by volume maximum.
   5. Water vapor permeance, ASTM E96: maximum 1.1 perms.
   6. Compressive Strength: Minimum 15 psi.
   7. Board Edges: Square edges.
   8. Locations: PT slab edges, concrete curbs.

B. Extruded Polystyrene Insulation at Slab on Grade: Foamular 400 extruded polystyrene insulation, cellular type, conforming to the following:
   1. Board Size: 24" x 96".
   2. Board Thickness: as required or noted on drawings.
   3. Thermal Resistance ASTM C518: R-5 per inch thickness.
   4. Water Absorption: In accordance with ASTM C272, .10 percent by volume maximum.
   5. Water vapor permeance, ASTM E96: maximum 1.1 perms.
   6. Compressive Strength:
      a. At slab on grade locations Minimum 40 psi.
      b. At parking garage locations Minimum 100 psi.
   7. Board Edges: Square edges.
   8. Locations: Below slab on grade within 24” of perimeter of heated space, and where indicated on the drawings.

2.3 RIGID BOARD INSULATION AT ROOF

A. Refer to Section 07 52 00 – Modified Bituminous Membrane Roofing.

2.4 ACCESSORIES

A. Tape: self-adhering type, 2 inch wide, as recommended by manufacturer.

B. Adhesive: Gun grade, mastic type, compatible with insulation and substrate and as recommended by the insulation manufacturer. Adhesive to also be compatible with sheet products that may underlay the insulation.
   1. Adhesives to comply with VOC limits shown in section 01 83 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and vapor barrier is installed and ready to receive insulation.

3.2 INSTALLATION - WALLS

A. Install insulation per manufacturer’s written instructions.

B. Apply adhesive in three continuous beads per board length, 1/8 inch thick. Daub adhesive tight to protrusions.

C. Place boards in method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

D. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

E. Tape insulation board joints.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit damage to insulation prior to covering.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 21 15

MINERAL WOOL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Mineral wool batt insulation at underside of overhangs and at exterior wood framed walls in locations and in thicknesses as indicated on the drawings.

B. Performance Requirement:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
2. Insulation to provide thermal resistance required by the current version of the Washington State Energy Code.
3. All products must be certified UL GreenGuard Gold or SCS Indoor Advantage Gold per ESDS criteria 6.1.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 07 21 16 - Blanket Insulation
2. Section 07 21 19 - Foamed-In-Place Insulation
3. Section 07 26 16 - Under-Slab Vapor Barriers
4. Section 07 27 00 - Air and Water Barriers.

1.2 REFERENCES

A. ASTM International:
1. ASTM C165 - 2007, Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
2. ASTM C209 - 2012, Standard Test Methods for Cellulosic Fiber Insulating Board.
3. ASTM C303 - 2012, Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
4. ASTM C356 - 2010, Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
5. ASTM C423 - 2009a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
6. ASTM C518 - 2010, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
7. ASTM C612 - 2010, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
8. ASTM C795 - 2008, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
9. ASTM C1104/C1104M - 2013, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
10. ASTM C1338 - 2008, Standard Test Method for Determining Fungi Resistance of Insulation

11. Materials and Facings.
12. ASTM E96/E96M - 2010, Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit data on product characteristics, performance criteria, thermal performance, limitations, recycled content and adhesives.
2. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation.
3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2.

C. ESDS Submittal: Provide submittals for ESDS documentation per section 01 81 13 – 1.6 C 12.

1.4 QUALITY ASSURANCE

A. Pre-installation conference and materials assembly:
1. General Contractor will make provisions for a pre-installation conference for all products and trades included in the assembly of the exterior wall system per 01 40 00.

B. Mock up: per section 01 40 00.
1. The subcontractor responsible for the work of this section to supply materials required for mock up.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Listed manufacturer: ROCKWOOL Inc., 8024 Esquesing Lane, Milton, Ontario.

B. Other manufacturers:

1. Certainteed Corporation.

2.2 DESCRIPTION

A. Non-combustible mineral wool batt insulation for exterior cavity wall sheathing applications to ASTM C665, Type 1.

2.3 PERFORMANCE CRITERIA

A. Batt insulation for exterior walls: To ASTM C612, Type IVB.
   1. 1. Fire performance:
      a. a. Surface Burning Characteristics: To ASTM E84.
         1) 1) Flame spread: 0.
         2) 2) Smoke developed: 0.
   2. Thermal resistance (R value of 30 for 7.25” thick per ASTM C518.
   3. Moisture resistance:
      a. Moisture sorption: 0.28 % maximum to ASTM C1104/C1104M.
      b. Water vapor transmission: 35 perm to ASTM E96, Desiccant Method.
      c. Water absorption: 1.2 % to ASTM C209.
   4. Greenguard Gold Certified.

2.4 MATERIALS

A. Non-combustible mineral wool batt insulation.
   1. Size: 24 x 48 and 48 x 72 inches.
   2. Thickness: 2 and 3 inches.
   3. Acceptable Material: Rockwool Inc., COMFORTBATT™.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and vapor barrier is installed and ready to receive insulation.

3.2 INSTALLATION

A. General:
   1. Install insulation in accordance with manufacturer’s written recommendations.
   2. Install insulation to maintain continuity of thermal protection to building elements and spaces.
   3. Do not enclose insulation before inspection.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit damage to insulation prior to covering.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 21 16

BLANKET INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Sound attenuation batt insulation at unit demising walls, floor / ceiling assemblies and where indicated in drawings.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
2. Batt insulation to be UL Greenguard Gold Certified per ESDS criteria 6.01a.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 07 21 13 - Board Insulation.
2. Section 07 26 00 - Vapor Barriers and Vapor Retarders.
3. Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.
4. Section 07 84 00 - Firestopping.

1.2 REFERENCES

A. ASTM International:
1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
4. ASTM E970 - Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

B. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit data on product characteristics, performance criteria, thermal resistance, and limitations.
2. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.
3. Provide submittals showing batt insulation is UL Greenguard Cold certified per specification section 01 81 13 – 1.6 C 12.

C. Informative Submittals:
1. Product Data: provide Environmental Product Declaration if available.

1.4 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
1. Batt Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Mock up: per section 01 40 00.
1. Insulation contractor shall attend the mock-up.

1.5 WARRANTY

A. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 BATT INSULATION

A. Listed Manufacturer: Owens Corning Thermal Batt Fiberglass Insulation, unfaced fiberglass batts.

B. Manufacturers:
1. Knauf Insulation (EcoBatt).
2. Johns Manville.
3. CertainTeed Corporation.
4. Guardian Fiberglass, Inc.
5. Celotex Corporation.

2.2 COMPONENTS

A. Acoustic Batt Insulation: Owens Corning QuietZone Pink Fiberglass Acoustic Batt Insulation.
1. Thermal Resistance: N/A.
2. Facing: unfaced.
3. Complies with ASTM C665, Type I
4. Flame Spread: maximum 10 per ASTM E 84.
5. Smoke developed: maximum 10 per ASTM E 84.
6. Location: Wood and metal framed walls with STC ratings (typically unit party walls and corridor walls) and all wood framed floor assemblies.
7. Attachment: Friction Fit.
8. UL Greenguard Gold Certified.

B. Acoustic Sealant:
1. USG, Presstite, Tremco or AC Horn.

2. Non-setting, non-staining, acoustically tested.
3. Sealant to comply with VOC limits in section 01 83 13 – 2.2 B.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION

A. Install per manufacturer's written instructions.

B. Install in exterior wall spaces or interior wall spaces as indicated on drawings without gaps or voids. Do not compress insulation.

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

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation. Wrap electrical outlets, switches and the like.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Foamed-in-place insulation at incidental locations at exterior framed walls, exterior wall crevices requiring air seal, exterior metal door frames, at the underside of roof drain bodies and at junctions of dissimilar wall and roof materials to achieve air seal.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for specific requirements.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 07 26 00 - Vapor Retarders.
2. Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.
3. Section 08 11 15 – Metal Doors and Frames

1.2 REFERENCES

A. ASTM International:
1. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
2. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
3. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit product description, insulation properties, preparation requirements, and limitations.
2. Manufacturer's Installation Instructions: Submit special procedures for perimeter or other conditions requiring special attention.

3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.
4. Submit proof that no HFC blowing agent is included per ESDS 6.1.

1.4 QUALITY ASSURANCE

A. Mock up: per section 01 40 00.
   1. Subcontractor responsible for the work of this section to attend.

B. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
   2. Overcoat: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
   2. Installer: Company specializing in performing Work of this section with minimum three years experience and approved by manufacturer.

1.5 WARRANTY

A. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Install insulation when ambient temperature is within range allowed by manufacturer.

PART 2 PRODUCTS

2.1 FOAMED-IN-PLACE INSULATION

A. Manufacturers:
   1. BASF.

2.2 COMPONENTS

A. BASF Spraytite 158: two-part, high performance closed cell polyurethane foam.
   1. Spray foam uses Zone3 zero-ozone-depleting HFO blowing agent.
   2. No HFC blowing agents allowed.

2.3 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work within construction spaces or crevices is complete prior to insulation application.

C. Verify surfaces are clean, dry, and free of matter capable of inhibiting insulation adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer to substrates where required.

3.3 INSTALLATION

A. Install per manufacturer’s written instructions.

B. Apply insulation by spray method, to uniform monolithic density without voids.

C. Apply to achieve thermal resistance rating indicated on drawings.

D. Apply overcoat monolithically, without voids, to fully cover foam insulation and to achieve fire rating where required.

E. Patch damaged areas.

3.4 LOCATIONS

A. Door frames as shown on sheet A570.

3.5 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspection will include verification of insulation and overcoat thickness.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit subsequent construction Work to disturb applied insulation.

3.7 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 26 00

VAPOR RETARDER

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Sheet and sealant materials for controlling vapor diffusion.

B. Performance Requirements:
   1. Class I vapor retarder, 0.1 perm or less when tested in accordance with ASTM E96, Test Method A.
   2. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. Sealant, Waterproofing and Restoration Institute: SWRI - Sealant Specification.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action submittals:
   1. Product Data: Submit data indicating material characteristics, performance criteria and limitations.
   2. Manufacturer's Installation Instructions: Submit preparation and installation requirements, techniques.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.

B. Mock up: per section 01 40 00.
   1. The subcontractor responsible for the work of this section to attend.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS

A. Location: installed on warm side of exterior wood framed walls.

B. Manufacturers:
1. CertainTeed, Membrain vapor retarder.

C. Sheet Retarder: Polyimide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to grater than 10 perms using the wet cup method.
1. Water Vapor Permeance:
   a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
   b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).
2. Fire Hazard Classification: ASTM E 84:
   a. Maximum Flame Spread Index; 20.
   b. Maximum Smoke Developed Index; 55.

2.2 ACCESSORIES

A. Tape: self-adhering type, 2 inch wide, compatible with sheet material, as recommended by the manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove loose or foreign matter capable of puncturing or damaging membrane.

3.2 INSTALLATION OF VAPOR RETARDER

A. Install in compliance with manufacturer's instructions.

B. Install vapor retarder on warm-in-winter side of the insulation.

C. Tape all seams and laps with manufacturer’s approved tape.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 26 16

UNDER SLAB VAPOR BARRIER

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Furnish and install vapor-impermeable sheet vapor barrier system below concrete slab-on-grade conditions, as shown on architectural drawings and described herein.
2. Vapor barrier shall be sealed at joints, lap seams, transitions, and penetrations to achieve a continuous and vapor-impermeable medium capable of prohibiting vapor drive through concrete slab on grade.
3. Provide accessories, flashings, fasteners, and other components necessary for a complete installation.

B. Performance Requirements:
1. Class I vapor retarder, 0.1 perm or less when tested in accordance with ASTM E96, Test Method A.
2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
1. Vapor barrier shall be provided at slab on grade to prevent migration of contaminated vapor into interior spaces per the requirements of the Environmental Engineer. See specification section 02 81 00.
2. Install two layers of vapor barrier below slab with staggered joints.

D. Related Sections:
1. Division 03 – Cast-in-Place Concrete
2. Division 07 – Vapor Retarders

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):
1. ASTM E1745 -11: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
2. ASTM E1643-11: Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. Technical Reference – American Concrete Institute (ACI):
1. ACI 302.2R-06: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Action Submittals:
1. Before commencement of the Work, provide to the following to the

Architect/Consultant:
a. Product literature including Technical Data Sheets (TDS) for each component.
b. Manufacturer's installation instructions for placement, seaming, penetration repair, and perimeter seal per ASTM E1643.

2. Sample Warranty: Provide manufacturer's standard material warranty indicating that product shall be free from defects for the period indicated.
3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13

C. Informative Submittals:
1. Product Data: provide Environmental Product Declaration if available

D. ESDS Binder: Include manufacturer's product information showing vapor barrier thickness under Criterion 7.12.

1.4 QUALITY ASSURANCE

A. Qualifications
1. Installer/Tradesmen involved in the Work of this Section shall have a minimum 5 years' documented experience regarding installation of components.
2. Quality control and quality assurance of installation is the responsibility of the General Contractor.
a. Architect and Owner may, at their discretion, review installation for conformance with project documents, but final quality control shall be implemented by General Contractor.

B. Single Source
1. All materials to be provided by a single-source manufacturer. Use products provided by or recommended in writing by manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, HANDLING AND STORAGE

A. Deliver and store materials in original wrappings and containers with manufacturer's seals, labels and batch/serial numbers intact and legible.

B. Protect from moisture, water, UV exposure and damage. Provide and maintain dry, off-ground weatherproof storage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 UNDER-SLAB VAPOR BARRIER MEMBRANE

A. Basis of Design: Stego Wrap Vapor Barrier (15 mil) by Stego Industries LLC. – (877) 464-7834 www.stegoindustries.com.

B. Equivalent approved products meeting all performance and submittal requirements.

2.2 PERFORMANCE CHARACTERISTICS

A. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

B. Other performance criteria:
   1. Strength: ASTM E1745 Class A.
   2. Thickness: 15 mils minimum

C. Provide third-party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

2.3 ACCESSORIES

A. Seams:
   1. Stego Tape by Stego Industries LLC

B. Penetrations of Vapor Barrier:
   1. Stego Mastic by Stego Industries LLC
   2. Stego Tape by Stego Industries LLC

C. Perimeter/Edge Seal:
   1. Stego Crete Claw by Stego Industries LLC
   2. Stego Term Bar by Stego Industries LLC
   3. StegoTack Tape (double sided) by Stego Industries LLC

D. Screed Pins:
   1. Non-penetrating, pedestal type to prohibit penetration of vapor retarder
   2. Stake-Rite by Bolt-Rite or equal

PART 3 EXECUTION

3.1 PREPARATION

A. Ensure subsoil is approved by Architect or Geotechnical Engineer.
   1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
   1. Install two layers of vapor barrier with lapped seams.
   2. Extend vapor barrier to perimeter of slab. Terminate vapor barrier at perimeter foundation wall. At point of termination, seal vapor barrier to foundation wall.
   3. Seal vapor barrier to entire perimeter wall or footing/grade beam with double-sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer’s instructions. Ensure concrete is clean and dry

prior to adhering tape.

4. Overlap joints 6" and seal with manufacturer’s seam tape.
5. Apply seam tape/Crete Claw to clean and dry vapor barrier.
6. Seal all penetrations (including pipes) per manufacturer’s instructions.
7. Do not allow screed pins for slab finish work to penetrate vapor retarder. Only pedestal-type screed pins (as noted in Part 2 of this Section) should be considered.
8. No penetration of vapor retarder is allowed except for reinforcing steel and permanent utilities.
9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture, and tensile.

3.3 WASTE MANAGEMENT

1. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 27 00

AIR BARRIERS AND WEATHER-RESISTIVE BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Vapor permeable air and weather-resistive barriers installed as a drainage plane in exterior wall assemblies. See also spec section 07 27 27 Self-Adhered Air and Water Barriers.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for specific requirements.
2. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into or out of the conditioned space. The air barrier shall have the following characteristics:
a. It must be continuous, with all joints made airtight.
b. Air barrier membranes shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 1.57, when tested in accordance with ASTM E2178.
c. Full air barrier system shall have an air permeability not to exceed 0.4 cfm/sq. ft. under a pressure differential of 1.57 psf, when tested in accordance with ASTM E779.
d. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
e. It shall be durable or maintainable.
f. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
1) Foundation and walls
2) Walls and windows or doors
3) Different wall systems
4) Wall and roof
5) Wall and roof over unconditioned space
6) Walls, floor and roof across construction, control and expansion joints
7) Walls, floors and roof to utility, pipe and duct penetrations

C. Project Specific Requirements: None

D. Related Sections:
1. Section 04 20 19 – Veneer Unit Masonry.
2. Section 07 26 00 - Vapor Barriers and Vapor Retarders.
3. Section 07 27 27 – Self Adhered Applied Flashing Membrane.
4. Section 07 46 00 - Fiber-Cement Siding.
5. Section 07 62 00 - Sheet Metal Flashing and Trim.

6. Section 07 90 00 - Joint Protection.

1.2 REFERENCES

A. American Society of Civil Engineers: ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM International:
1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
3. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
4. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
5. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
6. ASTM E 1677 - Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
7. ASTM E 2178 - Test Method for Air Permeance of Building Materials.

C. Sealant, Waterproofing and Restoration Institute: SWRI - Sealant Specification.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit data on material characteristics, performance criteria, and limitations.
2. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.
3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Mock up and pre-installation conference per Section 01 40 00 – 1.5.
1. The subcontractor responsible for the work of this section is required to attend.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Ten-year manufacturer’s warranty.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURER, PRODUCT

A. Manufacturer, Product:
   1. Dupont Tyvek Commercial Wrap.

B. Performance Criteria:
   1. Air Penetration Resistance: .001 cfm/sf @ 1.57 psf per ASTM E2178, and Type 1 per ASTM E1677.
   2. Water Vapor Transmission: 23 perms per ASTM E96-00 Test Method A, and 28 perms per ASTM E96-00 Test Method B (vapor permeable).

2.2 ACCESSORIES

A. Tape: DuPont Flashing Tape. Self-adhering type, polyproplylene film with butyl rubber adhesive, as recommended by the sheet manufacturer and compatible with sheet material.

B. Attachments: staples as recommended by the sheet manufacturer. Cap-nails or cap-staples as recommended by the manufacturer if sheet is to be exposed to wind forces for a period of time prior to installation of rainscreen or cladding materials.

C. Sealant:
   1. OSI H2U.
   2. See section 07 90 00.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not begin installation until all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions. Refer to the drawings for application sequence for products of this Section.

B. Carefully and accurately lay out, cut, fit and install to detail.

C. Install products weather-fashion, facilitating the passage of water or moisture toward drainage paths or weep holes as detailed.

D. Install horizontally, with horizontal overlaps of 6" and vertical overlaps of 6" minimum or per manufacturer’s requirements.

E. Fasten with staples. If sheet installation will not be followed immediately with the installation of rainscreen furring or cladding materials and the sheet will be subjected to wind forces, then cap-nails or cap-staples must be used as fasteners. Exposed staples shall be taped.

F. Install tape at all vertical and horizontal seams to form air barrier.

G. Install either tape or sealant at all penetrations for plumbing, electrical or other devices. Tape all tears or punctures.

H. Install product to maintain continuity across different substrates.

I. Cover product that is exposed to sunlight within the time limits recommended by the manufacturer.

J. Do not leave weather resistive barrier exposed – cover with siding within time limit recommended by the manufacturer.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit adjacent work to damage work of this section.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 27 27

SELF-ADHERED SHEET AIR AND WATER BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes:
   1. Materials and installation methods for self-adhered vapor, water and air barrier membrane system as indicated in Architectural Drawings.
   2. Materials shall be either permeable or impermeable, as indicated in the drawings, and specified elsewhere in this Section.
   3. Materials and installation methods to bridge and seal water and air leakage pathways in roof and foundation junctions, fenestration openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Performance Requirements
   1. General: Air barrier materials shall perform as a continuous vapor and air barrier and as a liquid water drainage plane, flashed to discharge incidental condensation or water penetration to the exterior. Air barrier assemblies shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
   2. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into or out of the conditioned space. The air barrier shall have the following characteristics:
      a. It must be continuous, with all joints made airtight.
      b. Air barrier membranes shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 1. 57, when tested in accordance with ASTM E2178.
      c. Full air barrier system shall have an air permeability not to exceed 0.4 cfm/sq. ft. under a pressure differential of 1.57 psf, when tested in accordance with ASTM E779.
      d. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
      e. It shall be durable or maintainable.
      f. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
         1) Foundation and walls
         2) Walls and windows or doors
         3) Different wall systems
         4) Wall and roof
         5) Wall and roof over unconditioned space

6) Walls, floor and roof across construction, control and expansion joints
7) Walls, floors and roof to utility, pipe and duct penetrations

3. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight

C. Project Specific Requirements: None

D. Related Sections:
1. Division 03 – Cast-In-Place Concrete
2. Division 04 – Unit Masonry
3. Division 06 - Gypsum Sheathing
4. Division 07 – Self-Adhering Sheet Waterproofing
5. Division 07 – Elastomeric Membrane Roofing
6. Division 07 – Sheet Metal Flashing and Trim
7. Division 07 – Joint Sealants
8. Division 08 – Vinyl Framed Windows and Doors
9. Division 08 – Glazed Aluminum Window Wall
10. Division 08 – Aluminum Framed Storefronts and Entrances

E. Definitions
1. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.2 REFERENCES

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
1. ASTM C920 - Specifications for Elastomeric Joint Sealants
2. ASTM D412 - Standard Test Methods for Rubber Properties in Tension
3. ASTM D570 - Test Method for Water Absorption of Plastics
4. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
5. ASTM D1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting
6. ASTM D1876 - Test Method for Peel Resistance of Adhesives
7. ASTM D1938 - Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
8. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
9. ASTM D4263 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
10. ASTM D4541 - Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
11. ASTM D5034 - Test Method for Breaking Strength and Elongation of Textile Fabrics
12. ASTM E96 - Test Methods for Water Vapor Transmission of Materials
13. ASTM E154 - Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover

14. ASTM E1186 - Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
15. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials
16. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
17. AATCC-127 - Water Resistance: Hydrostatic Pressure Test (American Association of Textile Chemists and Colorists)

1.3 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of all components to be used under this section.

B. Shop Drawings: Show locations and extent of air barrier. Include manufacturer standard and non-standard details for substrate joints and cracks, counter flashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mock-ups.

C. Samples:
   1. Self-adhered air barrier membrane
   2. Self-adhered transition membrane
   3. Self-adhered through wall flashing

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: For applicator, indicating compliance with Article 1.7C.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1. 10.

1.4 QUALITY ASSURANCE

A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of **10** years' experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for the Project, whose work has resulted in applications with a record of successful in-service performance.

C. Mock-Ups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mock-ups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate

surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mock-up to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
2. If Architect determines mock-ups do not comply with requirements, reconstruct mock-ups and apply air barrier until mock-ups are approved.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate the Work with related and adjacent work. Pre-installation conference shall include the Contractor, Installer, Architect, and System Manufacturer's Field Representative. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

1.5 WARRANTY

A. Submit manufacturer's warranty that air barrier and accessories are free of defects and are manufactured to meet manufacturer's published physical properties and material specifications.

B. Warranty Period: **five** years from date of completion of the air barrier membrane installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Do not double stack pallets of fluid applied components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer.

B. Protect substrates from environmental conditions that affect performance of air barrier.

C. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are pre-approved for use on this project:
   1. Grace Construction Products
   2. Soprema, Inc.
   3. Tremco Commercial Sealants and Waterproofing
   4. Protecto Wrap Company

2.2 SELF-ADHERED AIR AND WATER BARRIER MEMBRANES

A. Not used this project.

2.3 TRANSITION MEMBRANES

A. Transition Membrane: A self-adhesive waterproof membrane consisting of rubberized asphalt integrally bonded to a cross-laminated, high-density polyethylene film to provide a minimum 40-mil-thick membrane. Membrane should be interleaved with disposable release paper until installed.
   1. Basis of Design:
      a. Grace Perm-a-Barrier Detail Membrane
      b. Soprema Sopraseal Stick 1100T
      c. Tremco ExoAir 110/110LT
      d. Protecto Wrap PW 100-40
   2. Product shall have the following physical properties:
      a. Water Vapor Transmission: ASTM E96, Method B: 0. 05 perms maximum
      b. Air permeance at 1.57 psf pressure difference: 0.04 cfm/ft^2 maximum

B. Foil-Faced Transition Membrane: A self-adhesive waterproof membrane consisting of rubberized asphalt integrally bonded to an aluminum film to provide a minimum 40-mil-thick membrane. Membrane should be interleaved with disposable release paper until installed.
   1. Basis of Design:
      a. Grace Perm-a-Barrier Aluminum Flashing
      b. Soprema Soprasolin HD
      c. Tremco ExoAir Foil Flashing
      d. Protecto Wrap PS-45

C. Flexible Membrane Through Wall: A self-adhesive waterproof membrane consisting of rubberized asphalt integrally bonded to a cross-laminated, high-density polyethylene film to provide a minimum 40-mil-thick membrane. Membrane should be interleaved with disposable release paper until installed.
   1. Basis of Design:
      a. Grace Perm-a-Barrier Wall Flashing
      b. Soprema Sopraseal Stick 1100t
      c. Tremco ExoAir TWF

D. High-Temperature Self-Adhering Sheet Membrane: Provide self-adhered waterproof membrane consisting of a butyl rubber adhesive layer laminated to an HDPE liner, suitable for high-temperature applications. Membrane should be interleaved with disposable release paper until installed.
   1. Basis of Design:

a. Grace Ultra
b. Tremco ExoAir Foil Flashing

2. Product shall have the following physical properties:
a. Membrane Thickness: Minimum 30 mils, ASTM D3767 Method A.
b. Permeance (maximum): 0. 05 Perms, ASTM E96.
c. Service Temperature: Maximum 300 degrees F per ASTM D1204

E. Self-Adhering Sheet Membrane Roof Underlayment at metal roofing: Provide self-adhered waterproof membrane consisting of a rubberized asphalt surface with high density cross laminated polyethylene film. Membrane should be interleaved with disposable release paper until installed.

1. Basis of Design:
a. Grace Ice and Water Shield

2. Product shall have the following physical properties:
a. Membrane Thickness: Minimum 40 mils, ASTM D3767 Method A.
b. Permeance (maximum): 0. 05 Perms, ASTM E96.
c. Service Temperature: Maximum 260 degrees F per ASTM D1204

2.4 ACCESSORIES

A. Primer: For each membrane and substrate condition, designed to provide a high-tack finish suitable for membrane application and adhesion, as recommended by manufacturer in published literature based on lab testing and field experience.

1. Basis of Design:
a. Grace Perm-a-Barrier WB primer or as otherwise recommended
b. Soprema Elastocol Stick or as otherwise recommended
c. Tremco ExoAir Primer or as otherwise recommended
d. Protecto Wrap VOC-100

B. Detailing Mastic: An elastomeric, trowel-grade material designed for use with self-adhered membranes and tapes.

1. Basis of Design:
a. Grace Bituthene Liquid Membrane
b. Soprema Sopramastic
c. Tremco ExoAir Termination mastic
d. Protecto Wrap JS 160H Mastic

C. Joint Sealant: Refer to Section 07 92 00 – Sealants, and as recommended by manufacturer for use with their system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates and conditions are ready to accept the Work of this Section and in compliance with membrane manufacturer’s published recommendations. Notify Architect and Consultant in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of prepared substrates.

B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.

C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.2 SURFACE PREPARATION

A. Refer to and comply with manufacturer’s literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil, and wax from exposed surfaces. Remove dust, dirt, loose stone, and debris. Use repair materials and methods that are acceptable to manufacturer of the air barrier assembly.

B. Exterior sheathing panels: Ensure boards are sufficiently stabilized with corners and edges fastened with appropriate screws, in accordance with exterior sheathing manufacturer’s written instructions.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, dry substrate for air barrier application.

F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

G. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

H. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

I. At changes in substrate plane, apply manufacturer-recommended sealant or detailing mastic at sharp corners and edges to form a smooth transition from one plane to another.

3.3 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.

C. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

E. At end of each working day, seal top edge transition membrane to substrate with termination sealant.

F. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

G. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3" of coverage is achieved over both substrates.
   1. Transition Membrane: Roll firmly to enhance adhesion.

H. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

I. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fishmouths and blisters. Patch with transition membrane extending 6" beyond repaired areas in strip direction.

3.4 FIELD QUALITY CONTROL

A. Membrane Manufacturer’s Representative shall, as coordinated by the installer, attend periodic site visits to review and comment on the installation. Review shall focus on installation compliance with published instructions. Where pertinent, representative shall also provide recommendations on unique conditions.
   1. Manufacturer’s Representative shall furnish field visit report to Contractor and Architect following visit.

B. Testing Agency: Owner may engage a qualified testing agency to perform tests and periodic reviews and prepare test reports.

C. Periodic Reviews: Air barrier materials and installation are subject to periodic reviews for compliance with requirements. Reviews may include the following:
   1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   8. Termination sealant has been applied on cut edges.
   9. Transition membrane has been firmly adhered to substrate.
   10. Compatible materials have been used.
   11. Transitions at changes in direction and structural support at gaps have been provided.
   12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
   13. All penetrations have been sealed.

D. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
   1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

E. Quality Control and Quality Assurance of installation remains the full responsibility of the Contractor and Installer. Reviews by Manufacturer’s Representative, Architect, and Owner’s Representative are intended to provide documentation of installation only.

F. Remove and replace deficient air barrier components and retest as specified above at no additional cost to owner.

3.5 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 42 13

EXTERIOR METAL ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Exterior metal panel roofing and related trim, flashings, accessories and fastenings. Install in locations indicated on Architectural drawings.

B. Performance Requirements:
1. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code and as measured in accordance with ASTM E330.
2. Design Pressure: Minimum 20 lb/sq ft.
3. Maximum Allowable Deflection of Panel: 1/180 of span.
4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Air Infiltration:
   a. Panel (without insulation) to meet the following standard when tested in accordance with ASTM E283:
   b. With sidelap sealant: 0.06 cfm/lf (5.64 lm/m) of panel seam at a static difference of 1.57 psf (7.67 kg/sq.m).
7. Water Penetration:
   a. Panel to meet the following standard when tested in accordance with ASTM E331:
   b. With sidelap sealant – no leakage at 6.24 psf (30.5 kgf/sq.m) and 12 psf (59 kg/sq.m).
8. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.
3. Section 07 41 50 – Exterior Metal Wall Panel
4. Section 07 45 00 - Rainscreen System.
5. Section 07 62 00 - Sheet Metal Flashing and Trim.
6. Section 07 90 00 - Joint Protection.
7. Section 08 52 00 - Wood Windows.
8. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. American Society of Civil Engineers: ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM International:
1. ASTM A606 - Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
2. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
3. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
4. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
5. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit data indicating materials, component profiles, fastening methods, jointing details, sizes, surface texture, and accessories.
2. Shop drawings: Submit shop drawings indicating thickness and dimensions of parts, fastenings and anchoring methods, details and locations of seams, transitions and other provisions necessary for thermal expansion and contraction.
3. Fasteners: Submit manufacturer's printed criteria specifically addressing the penetration of fasteners into substrate materials (plywood sheathing vs. solid framing) beneath the siding, including depth of penetration.
4. Samples: Submit two samples 12 x 12 inch in size illustrating surface color and finish.
5. Warranty: Submit proposed warranty documents as specified in this document.
6. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Mock up: per section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish minimum five-year manufacturer warranty for new siding products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store in ventilated areas with constant minimum temperature according to manufacturer's printed requirements. Protect panels against standing water and condensation.

C. Handle panels with non-marring slings.

D. Do not bend panels.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 MANUFACTURED METAL SIDING

A. Listed Manufacturer: AEP Span, a division of ASC Profiles Inc. Tacoma, WA.

B. Metal siding and roofing material:
1. Steel conforming to ASTM A-792, minimum strength yield 50,000 psi, thickness 22 gauge.
2. Protective Coating: Zincalume (zinc=45%, Aluminum=55%) conforming to ASTM A-792, AZ50.
3. Exterior Finish:
a. DuraTech® 5000 (Polyvinylidine Fluoride), full 70% Kynar® 500/Hylar 5000® consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 10-30% when tested in accordance with ASTM D-523- 89 at 60°.
4. Closure Pieces: manufacturer's standard neoprene or polyethylene foam, shaped to match the siding profile, installed with sealant per manufacturer's standard procedure.
5. Fasteners: Manufacturer's standard type to suit application and substrate material; with soft neoprene washers; fastener cap same color as exterior panel.
6. Flashings: Material, gauge and finish to match panels. Use manufacturer’s standard Trims & Flashings. Do not use lead or copper.

C. Other Manufacturers:
1. Substitutions: Section 01 60 00 – Product Requirements.

2.2 ROOF PANELS

A. Panel designation: Span-Lok hp.
1. Panel Configuration:
a. Pattern: vertical as shown on elevations.
b. Profile Description: 16 in. full panel
c. Nominal Panel Height: 2 inches, Nominal Panel Width: 16 inches.
2. Locations:
a. Exterior roof at level 1 as shown on drawing.

B. Panel Length: As shown on drawings.

C. Color Schedule:
   1. Cool Matte Black. DuraTech 5000 finish.

2.3 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; color to match siding

B. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining, non-skinning, non-shrinking, and non-sagging; color to match siding.

C. Snow Guards: locate at panels above exterior doors.
   1. Rocky Mountain Snow Guards Inc. Rocky Guard RG5 or equal.
   2. Match standing seam color.

D. Field Touch-up Paint: As recommended by panel manufacturer.

2.4 FABRICATION

A. Form sections to shape indicated on Drawings, accurate in size, square, and free from distortion or defects.

B. Panel Profile: Manufacturer’s standard profile for specified system.
   1. Fabricate corners in one continuous piece with minimum 6-inch returns.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify framing, substrate surfaces, rainscreen furring, and wall openings, and weather-resistive barrier are installed and ready to receive work.

3.2 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From plumb and level: 1/4 inch per 10 feet.

C. Maximum Offset From Joint Alignment: 1/16 inch.

3.3 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. PANELS AND FLASHING:
   1. Install per approved submittal drawings only.
   2. Overlap flashing at least 6 inches.
   3. Discrepancies between job site conditions and drawings as approved shall be brought to the attention of the Architect or Architect’s representative for resolution.

C. CUTTING AND FITTING:
   1. Neat, square, and true. Torch cutting is prohibited where cut is exposed to final view.

2. Openings 6 inches and larger in any direction: Shop fabricate and reinforce to maintain original load capacity.
3. Openings less than 6 inches in largest dimension: Made by trade requiring opening.

D. PANEL DAMAGE AND FINISH SCRATCHES:
1. Touch up paint is not necessary for panels with minor scratches.
2. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Architect's or Owner's representative.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 45 00

RAINSCREEN SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Rainscreen materials and installation, for placement behind exterior siding materials. Includes fasteners and accessory products.

B. Performance requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for specific requirements.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 27 00 - Air Barriers and Weather Resistive Barriers.
3. Section 07 46 00 - Fiber-Cement Siding.
4. Section 07 62 00 - Sheet Metal Flashing and Trim.
5. Section 07 90 00 - Joint Protection.
6. Section 08 53 00 - Plastic (PVC) Windows.

1.2 REFERENCES

A. American Wood-Preservers' Association:
1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
2. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

B. ASTM International:
1. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A653 - Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
3. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

C. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. National Institute of Standards and Technology: NIST PS 20 - American Softwood Lumber Standard.

E. National Lumber Grades Authority: NLGA - Standard Grading Rules for Canadian Lumber.

F. Northeastern Lumber Manufacturers Association: NELMA - Standard Grading Rules for Northeastern Lumber.

G. The Redwood Inspection Service: RIS - Standard Specifications for Grades of California Redwood Lumber.

H. Southern Pine Inspection Bureau: SPIB - Standard Grading Rules for Southern Pine Lumber.

I. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

J. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

K. Western Wood Products Association: WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit technical data for furring (strapping) materials, fasteners, cavity ventilation products, etc. if different than those specified.
2. Product Data: Submit technical data for field-applied wood preservative materials, and application instructions.
3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. Lumber Grading Agency: Certified by NIST PS 20.
2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.

B. Surface Burning Characteristics: Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Mock up: per section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend site meeting and furnish materials for mockup.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Protect materials from exposure to moisture prior to installation

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 FURRING/STRAPPING MATERIALS

A. Refer to the drawings for furring materials, location, and orientation (horizontal or vertical).

B. Wood, vertical orientation:
   1. Borate-treated 3/4" wood ripped to width shown on details. ¾ CDX plywood or 1x wood acceptable. Spacing of furring 16" centers or per siding manufacturer's requirements.

C. Metal siding manufacturer's clips. Spacing and details per manufacturer's requirements.
   1. Note that metal siding is not included for this project.

2.2 ATTACHMENT TO SUBSTRATE FRAMING

A. Fasteners for wood furring:
   1. For sodium borate treated furring: Hot-dipped galvanized nails (ZMAX with a G185 coating per ASTM A653, or G90 coating per same standard).
   2. For ACQ treated furring: Stainless steel (Types 304 or 316).
   3. Size to achieve embedment listed below. Spacing of fasteners 12" centers.

B. Fasteners into substrates other than wood framing (concrete): ¼" drilled-in rawl pins, stainless steel (Types 304 or 316) for ACQ treated furring. Spacing of fasteners 16" centers.

C. Fastener embedment: 1" minimum into solid wood substrate framing, unless otherwise specifically allowed in writing by the manufacturer of the siding material.

2.3 ACCESSORIES

A. Cavity ventilation:
   1. Cor-a-vent insect screen.
   2. Stainless Steel insect screen.

B. WRB, drainage plane, air barrier: refer to Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.

2.4 FACTORY WOOD TREATMENT

A. Wood or Plywood, preferred treatment: Water borne preservative treatment for lumber and plywood in conditions not subject to soil, weather, and/or continuous water contact to be sodium borate treatment, AWPA C31 for lumber and C9 for plywood.

B. Alternate treatment: ACQ preservative treatment. Note that stainless steel fasteners (Types 304 or 316) will be required.

C. Moisture Content After Treatment: Kiln dried (KDAT).
   1. Lumber: Maximum 19 percent.
   2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify adequacy of backing/blocking and support framing.

B Locate and mark solid wood framing (studs) behind sheathing materials so that furring members can be fastened directly to solid framing.

3.2 FURRING/STRAPPING INSTALLATION

A. Set furring members level if horizontal orientation, and plumb if vertical orientation, in correct position for subsequent attachment of siding materials.

B. Locate and install vertical furring directly over framing members, or as otherwise noted on the drawings. Note that at certain locations the drawings may indicate that additional furring is placed between the standard spacings.

C. Shim horizontal furring members off WRB with 1/8” shim per manufacturer’s requirements.

D. Fasteners shall penetrate into solid wood framing, unless otherwise indicated on the drawings or as otherwise allowed by the siding manufacturer and approved by the Architect. Owner may employ a Special Inspector to confirm that fasteners are driven only into solid wood framing.

E. Gap furring members at floor lines and at thru-wall flashings. Refer to details on the drawings.

3.3 VENTILATION AND SCREENING

A. Install vent product at the top and bottom of each cavity. Install in long lengths and in continuous fashion without gaps.

B. Fasten with galvanized roofing nails with penetration into solid framing or plywood sheathing. Drive fasteners such that product is not dented or deformed.

C. Install with insect screening facing toward the ventilation cavity (facing down at the top of the cavity and facing up at the bottom of the cavity) according to the manufacturer's instructions.

3.4 SITE APPLIED WOOD TREATMENT

A. Site-apply preservative treatment to cut ends of boards, or cut edges of plywood, only if the factory preservative treatment does not penetrate fully into the stock.

B. Brush-apply two coats of preservative treatment on wood or plywood edges after site cutting.

C. Allow preservative to dry prior to installing members.

3.5 QUALITY ASSURANCE

A. Moisture Content: take moisture readings of lumber and/or plywood furring prior to installation.

3.6 LOCATION

A. Install rainscreen at all Fiber Cement Panel Siding locations per manufacturer’s requirement:
   1. Siding labeled as FCP-1 and FCP-5 on elevations.

3.7 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Furring members: 1/4" from indicated position, maximum.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 46 00

FIBER-CEMENT SIDING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Exterior fiber cement panel siding for walls, related trim, flashings, accessories and fastenings.

B. Performance Requirements:
1. Durable, paintable, water shedding siding.
2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for specific requirements.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 27 00 - Air Barriers and Weather-Resistive Barriers.
3. Section 07 45-00 - Rainscreen System.
4. Section 07 62 00 - Sheet Metal Flashing and Trim.
5. Section 07 90 00 - Joint Protection.
6. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. American Hardboard Association: AHA A135.6 - Hardboard Siding.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action submittal:
1. Product Data: Submit data indicating materials, component profiles, fastening methods, jointing details, sizes, surface texture, and accessories.
2. Fasteners: Submit manufacturer's printed criteria specifically addressing the penetration of fasteners into substrate materials (plywood sheathing vs. solid framing) beneath the siding, including depth of penetration.
3. Samples: Submit one sample 6 x 6 inch in size illustrating surface texture and finish.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Mock up: per section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend site meeting and furnish materials for mockup.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish minimum fifty-year manufacturer warranty for new siding products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store in ventilated areas with constant minimum temperature according to manufacturer's printed requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install according to manufacturer’s written instructions.

B. Install when ambient temperature, humidity, and other environmental conditions are within range allowed by manufacturer.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 FIBER-CEMENT SIDING

A. Refer to drawings for location of each siding type.

B. Manufacturers:
   1. Basis of Design: James Hardie Building Products, Inc.

C. Siding Type FCP-1: Hardie Panels, Select Cedar Mill texture, factory primed for field finishing. Reveals formed with pre-primed sheet metal to match shape of Fry Reglet "T-Piece" and ½" gap to adjacent panel. Vinyl windows use 4/4 x 3.5” Hardie Trim Board trim on all sides. Corners use pre-primed sheet metal to match Fry Reglet "Inside Corner" and "Outside Corner" shapes. Through wall flashing at each floor level at window head elevation.

D. Siding Type FCP-2: Hardie Plank, Select Cedar Mill texture, factory primed for field finishing. Four-inch exposure alternating with Ten-inch exposure. Vinyl windows use 4/4 x 3.5” Hardie Trim Board trim on all sides. Corners use pre-primed sheet metal to match mitered plank siding look. Through wall flashing at each floor level at window head elevation.

E. Siding Type FCP-3: Hardie Plank, Select Cedar Mill texture, factory primed for field finishing. Four-inch exposure. Vinyl windows use 4/4 x 3.5” Hardie Trim Board trim on all sides. Corners use pre-primed sheet metal to match mitered plank siding look. Through wall flashing at each floor level at window head elevation.

F. Siding Type FCP-4: Hardie Panels, Select Cedar Mill texture, factory primed for field finishing. Vertical Battons 4/4 x 1.5” Hardie Trim Boards at 16” o.c. Vinyl windows use 4/4 x 3.5” Hardie Trim Board trim on all sides. Corners use pre-primed sheet metal to match Fry Reglet "Inside Corner" and "Outside Corner" shapes. Through wall flashing at each floor level.

2.2 RAINSCREEN SYSTEM

A. Refer to Section 07 45 00.

2.3 SOFFITS

A. Refer to drawings for location of each siding type.

B. Listed Manufacturer and Product: James Hardie Building Products, Inc.

C. Soffit Material: Hardie soffit, smooth surface, factory primed for field finishing.

2.4 ACCESSORIES

A. Nails: Fasteners of size (depth of penetration) and strength to securely and rigidly retain the work and as required by the siding manufacturer in printed instructions.

B. Weather Resistive Barrier: refer to Section 07 27 00.

C. Flashing: refer to Section 07 62 00.

D. Metal trim materials: Reveal Panel Trim extruded sheet metal products by Fry Reglet or shop broken 24 ga. pre-primed sheet metal trim.

1. Finish: Factory primed for field painting. Chemical conversion coat finish for field painting per ASTM ND 1730-67, Type B.
2. Typical shapes include "Inside Corner", "Outside Corner", "Vertical Molding" (for reveal joints), J-Channel (for window trim), and "T-Piece" (for reveal joints).

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify framing, substrate surfaces, rainscreen furring, and wall openings, and weather-resistive barrier are installed and ready to receive work.

3.2 INSTALLATION OF SIDING

A. Strictly comply with manufacturer's printed installation instructions, including nail size and spacing, nail penetration into solid wood or sheathing backing, nail head penetration into siding material, and the like.

B. If fasteners penetrate through rainscreen furring and into plywood sheathing, and not solid framing, confirm with siding manufacturer that this is acceptable practice.

C. Install metal flashings at wall edges, penetrations and openings as detailed. Install specified inside and outside corners as detailed.

D. At Hardie panels install T-Piece horizontally and vertically between panels creating a ½" reveal. Position panels so that the exposed edge at a reveal is a factory edge, and the edge of any cut panel is covered by the stem of the T-Piece. Refer to details.

E. Face nail panels according to manufacturer's instructions.

F. Position vertical reveals over rainscreen furring strips. Nail the flange of the T-Piece directly to a furring strip.

G. Paint per section 09 90 00.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From plumb and level: 1/4 inch per 10 feet.

C. Maximum Offset From Joint Alignment: 1/16 inch.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 53 03

THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes for Armory Building:
   1. UL-listed, fully-adhered, fleece-backed, fully-reinforced thermoplastic polyolefin (TPO) roofing membrane at locations per the Architectural Drawings.
   2. Provide all labor, accessories, and components necessary for a complete water tight installation
   3. Provide insulation, tapered insulation, and air barrier/vapor retarder membrane as indicated.
   4. Provide continuous tie-ins at roofing interfaces with adjacent components.
   5. Peel and stick self-adhesive membrane vapor barrier on plywood roof sheathing.

B. Section includes for new townhomes and apartments:
   1. UL-listed, fully-adhered, fleece-backed, fully-reinforced thermoplastic polyolefin (TPO) roofing membrane at all roof locations.
   2. Provide all labor, accessories, and components necessary for a complete water tight installation

C. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Roof decks and roof coverings shall be designed for wind load resistance by structural engineer of record.
   3. Roof system shall be listed as an approved roof assembly by applicable building Codes and shall be classified by Underwriters Laboratories (UL) and listed in the current UL Roofing Materials Directory detailing compliance with the specified fire classification.
   4. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   5. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
   6. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

D. Project Specific Requirements: None.

E. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 07 62 00 - Sheet Metal Flashing and Trim.
   3. Section 07 71 00 - Roof Specialties.

4. Section 07 72 33 - Roof Hatches.

1.2 REFERENCES

A. Comply with the following standards, current edition at date of Contract Execution:
   1. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials
   2. ASTM E96 – Test Methods for Water Vapor Transmission of Materials
   3. ASTM E108 – Test Methods for External Fire Tests of Roof Coverings
   4. ASTM E 6878 – 11a Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
   5. UL 790 – Standard Test Methods for Fire Tests of Roof Coverings
   6. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual, Latest Edition
   7. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). Architectural Sheet Metal Manual, Latest Edition

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Submit technical data sheets for all applicable components of the roofing system, including accessories.
   2. Test data indicating roofing assembly compliance with project uplift and their requirements.
   3. Submit manufacturer’s installation instructions for specified system.
   4. Submit tapered insulation shop drawings showcasing slope to drain points.
   5. Shop drawings
      a. Submit manufacturer’s standard shop drawings for each transition.
      b. Shop drawings to show extent of intended roofing installation.
   6. Mechanically-Fastened Insulation and Substrate Board Assemblies: Shop drawings shall be provided indicating faster layout and patterns conforming to uplift design as provided by structural engineer of record.
   7. Shop drawing shall indicate design uplift resistance of components as related to calculations by engineer.
   8. Submit manufacturer’s sample warranty.
   9. Submit installers’ letter / diploma from manufacturer certifying that installer is approved for a warrantable application of bid roofing system.

C. Closeout submittal: Operations and Maintenance Data:
   1. Submit manufacturer’s recommended maintenance procedures for roofing system, including precautions and warnings to prevent damage and deterioration to roofing system.
   2. Maintain copies of documentation on site in the job office. A bound copy shall be submitted independently to transfer to the Owner at completion of work.

1.4 QUALITY ASSURANCE

A. General: Applicator shall be officially recognized as an approved applicator by the roofing materials manufacturer and shall meet the following requirements:
   1. Provide evidence that they are an approved applicator in good standing with the specified or approved membrane manufacturer. Letter shall be on manufacturer's corporate letterhead, complete with signature from officer of the corporation.
   2. Employ a Superintendent and Foreman that are experienced in the application of the specified material and have been trained by the specified or approved manufacturer in the application of the materials.

B. Roofing System Pre-Installation Conference: Contractor shall conduct a pre-installation conference no less than five (5) days prior to commencing roofing activities. Parties responsible shall attend, including the Architect / Consultant, Owner, Contractor as well as any subcontractors / trades involved. Pre-Roofing Installation conference shall include:
   1. The review and coordination of installation procedures and required related work.
   2. Comprehensive review of substrate prior to application of roofing system components. Structural deck shall be clearly observable.
   3. Commencement of roof installation signifies that the installer has accepted the substrate and substrate is suitable for a warrantable roofing installation per manufacturer.

C. Source Limitations: Obtain components including roof insulation, fasteners, air barrier/vapor retarder, and accessories for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Upon successful completion of manufacturer and Architect / Consultant punch lists, manufacturer shall issue 30-year, NDL (no dollar limit) warranty to owner. Date of completed punchlist and all remedial items indicates commencement of warranty period.

C. Membrane, assembly and existing structure shall be guaranteed against leaks by manufacturer for a period not less than thirty (30) years. Roofing assembly (membrane, coverboard and accessories) shall be guaranteed against defects, discoloration and other related deleterious effects for duration of warranty period.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. General: Deliver and store materials in original wrappings and containers with manufacturer's seals, labels and batch / serial numbers intact and legible in accordance with manufacturers published recommendations.
   1. Store roofing rolls on pallets upright. DO NOT lay flat.
   2. Protect from freezing, moisture, salt spray UV exposure and damage.
   3. Maintain and store in a dry, weatherproof area. When storage is required outside, provide full protection with breathable canvas tarpaulins. Elevate roofing materials from horizontal surfaces away from moisture.
   4. Store materials in accordance with manufacturer's written and submitted recommendations.
   5. Store all temperature sensitive materials in a heated location with a 65° F minimum temperature and remove only as much as is needed for immediate use. Keep all materials away from open flame or welding sparks.

C. Materials Stored at Roof Deck (Immediate Use Only):
   1. Positively secure to prevent displacement by wind forces.

D. Materials opened and laid out for prefabrication shall be adequately secured at the end of each workday.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply roofing membrane during inclement weather or when ambient temperatures are above or below manufacturer's requirements, without proper weather protection.

C. Do not apply roofing membrane to damp or frozen deck surface.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

E. Emergency Water Cut-Off / Night Seals: Maintain on site equipment necessary to apply waterproof temporary edge seal in event of sudden storms, inclement weather and at end of each work day at unfinished locations.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with installation of associated roof penetrations and metal flashings, as Work of this section proceeds.

PART 2 PRODUCTS

2.1 SINGLE PLY ROOFING - FULLY ADHERED

A. Listed Manufacturer and Product:

1. Carlisle Companies Incorporated
2. Firestone

2.2 COMPONENTS

A. Exposed, Non-trafficable, Roofing
   1. Roof Membrane – Reinforced membrane with welded laps
   2. Adhesive – Expanding adhesive at full field of roof
   3. Substrate Board – Manufacturers recommended board material
   4. Tapered Insulation – Sloped polyisocyanurate insulation
   5. Insulation – Polyisocyanurate insulation
   6. Air barrier/Vapor Retarder – Self-adhered air impermeable vapor retarder membrane
   7. Substrate – wood sheathing

2.3 ROOF SYSTEM MATERIALS

A. Thermoplastic Polyolefin Membrane: Internal fabric-reinforced thermoplastic polyolefin sheet conforming to ASTM D 6878.
   1. Sure-Weld TPO Extra Fleece-Backed by Carlisle
   2. Thickness: 80 mils, nominal
   3. Exposed face color:
      a. White.

B. Substrate Board: Nominal 1/2” thick, high density gypsum coverboard with coated glass facer.
   1. Securock by USG
   2. Dens Deck Prime by Georgia Pacific
   3. As approved by alternate membrane manufacturer.

C. Rigid Thermal Insulation: Minimum 4’x8’ rigid polyisocyanurate insulation boards conforming to ASTM C 1289, Type II, Class 1. Insulation shall have a glass reinforced facer at top and bottom of board.
   1. Carlisle Secure-Shield Polyisocyanurate
   2. As approved by alternate membrane manufacturer.

D. Roof System Adhesive: Two component, spray-applied foaming polyurethane adhesive specifically formulated for fully adhered roofing systems, including membranes, coverboards and rigid insulation.
   1. Carlisle FAST Adhesive
   2. As approved by alternate membrane manufacturer.

E. Air / Vapor Control Membrane: Provide air/vapor barrier & temporary roof over the sheathing as shown on the project documents. A 40-mil thick composite consisting of 35-mil self-adhering rubberized asphalt membrane laminated to a 5-mil UV resistant poly film with an anti-skid surface which is fully compatible with Adhesive. Provide primer as required per manufacture recommendations.
   1. Carlisle 725TR Air and Vapor Barrier
   2. As approved by alternate membrane manufacturer.

F. General Membrane Sealant: Single component, non-sagging, gun grade polyurethane sealant specifically formulated for use at roof membrane terminations, temporary seals, fasteners and penetrations.
   1. Universal Single Ply Sealant by Carlisle.
   2. As approved by alternate membrane manufacturer.

G. Cut Edge Sealant: Single component, non-sagging, gun grade sealant specifically formulated for use at TPO membrane cuts at reinforced (field) areas.
   1. Sure-Weld TPO Cut Edge Sealant by Carlisle.
   2. Approved equivalent.

H. Butyl based high temperature self-adhered membrane for wall and other detail transitions.
   1. Grace Ultra by W.R. Grace

I. Fasteners: Threaded fasteners with 3” diameter plates as recommended by manufacturer for given structural substrate and uplift condition.

J. Penetration Flashings: Provide manufacturer’s standard proprietary preformed boot to be heat welded to field membrane per the project documents and manufacturer’s published details.

K. Roof Drains: provide cast iron bowl type drain with clamping ring and stainless-steel fastener and interlocking steel strainer. Requirements for sizes, intervals and layout of roof drains and drainage plan shall be calculated and designed by Architect.
   1. Pre-Approved Drain Manufacturer: Zurn
   2. Approved equivalent

L. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16-inch-thick and acceptable to roofing system manufacturer.
   1. Allow for 140 linear feet of 36” wide walkways.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify surfaces and site conditions are ready to receive Work.

C. Verify deck is supported and secure.

D. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, and suitable for installation of roof system.

E. Verify deck surfaces are dry and free of snow or ice.

F. Confirm dry deck by moisture meter with moisture content acceptable to roofing manufacturer.

G. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and can’t strips, wood nailing strips, and reglets are in place.

3.2 PREPARATION

A. Prior to start of work, contractor shall evaluate and deem existing roof substrate suitable for installation of new roofing system per the project documents. It is the responsibility of the contractor to ensure that existing roof substrate will not prohibit roof from draining per approved tapered shop drawings.
   1. Ponding water, regardless of manufacturer statements, claims or published literature will not be acceptable at locations where roofing system is installed. Ponded areas shall be remediated prior to issuance of warranty as part of bid work and will be provided at no additional cost to owner. Increase to project schedule / duration will not be considered.

B. Contractor shall advise Architect / Contractor of any areas that will require remediation prior to installation.

C. Start of work constitutes that contractor has accepted roof substrate and site conditions for a warrantable application per roofing manufacturer.

3.3 WOOD DECK REVIEW

A. Wood decking shall be sound, well-seasoned or kiln dried and of proper thickness to accommodate design loads (including wind up-lift) according to specified design criteria and/or local building code requirements.

3.4 AIR BARRIER / VAPOR RETARDER MEMBRANE

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

B. Install substrate board as needed for air barrier vapor retarder if structural substrate is not suitable per manufacturer recommendations.

C. Prime as recommended by manufacturer.

3.5 INSTALLATION OF TAPERED RIGID INSULATION AND RIGID COVERBOARD

A. General: Install materials in strict conformance with the manufacturer's published instructions. Roof insulation shall be installed where by the long dimension of the board(s) run in parallel alignment and the short dimensions are staggered.

B. Boards shall be installed with minimum joint dimensions and shall be tightly butted where possible. Maximum joint widths shall be 3/8 inch. Damaged corners shall be cut out and replaced with an insulation piece a minimum of 12-inch x 12- inch Pieces which are cut from larger panels and are smaller than one square foot will not be accepted.

C. Install no more material than can be covered during the same working day.

D. Taper roof insulation to drain sumps using tapered edge strips. If an insulation layer is 1-1/2 inches or less, taper 12 inches from the drain bowl. If insulation thickness exceeds 1-1/2 inches, taper 18 inches from the drain bowl. All taper boards or pieces must be adhered or mechanically fastened with a minimum of two fasteners per board.

E. When a cover board and/or multiple layers are installed each layer should be offset from the previous layer a minimum of 12 inches on center.

F. At the end of each working day, provide a watertight cover on all unused insulation as to avoid moisture penetration.

3.6 MEMBRANE INSTALLATION

A. General: Install membrane in strict conformance with the manufacturer's published instructions (including guide specifications and details) and project documents.

B. Work shall be coordinated to ensure that sequencing of the installation promotes a 100% watertight installation at the end of each day.

C. Un-roll approximately 30 feet of the fleece-backed roofing membrane and position roll over the properly installed/prepared substrate. Pull the tail back over the roll to expose a workable area (approx. 30') of substrate. (Do not utilize the "butterfly method".

D. Apply a 100% continuous coat of adhesive to the substrate per the manufacturer.

E. The amount substrate that can be coated with a workable amount of adhesive will be determined by application method, ambient temperature, humidity and available manpower.

F. To ensure proper application and curing of the adhesive, the outside air temperature shall be above 50°F and rising.

G. Spray applied adhesive must also be rolled out by roller to ensure a smooth, even 100% coverage of the substrate with no voids, skips, globs, puddles or similar irregularities.

H. Allow the solvents in the adhesive to slightly dissipate/cure only to the point that the adhesive is "sticky" but still "wet". Do not allow adhesive to "dry".

I. Adhesives shall not be installed over moist or wet substrates.

J. Broom the adhered portion of the membrane to ensure full contact and complete the bonding process by firmly pressing the bonded membrane into place with a weighted, foam-covered, lawn roller.

K. Repeat the process for the remaining un-bonded portion of the membrane, lapping subsequent, adjacent rolls of membrane a minimum of 3 inches, ensuring proper shingling of the membrane to shed water along the laps.

L. No adhesive shall be applied to the lap "seam" areas of the membrane. Areas contaminated with adhesive are difficult to clean, will impair proper welding of the seams and require a membrane patch.

3.7 HOT AIR WELDING

A. General:
1. Field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
2. Field seams must be clean and dry prior to initiating any field welding.
3. Remove foreign materials from the seams (dirt, oils, etc.) with authorized solvent per roofing manufacturer. Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. Do not use denim or synthetic rags for cleaning.
4. Welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.
5. Contaminated areas within a seam will inhibit proper welding and will require a membrane patch.

B. Hand Welding:
1. The lap or seam area of the membrane should be intermittently tack welded to hold the membrane in place.
2. The back "interior" edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.
3. The nozzle of the hand held hot air welder shall be inserted into the lap at a 45° angle to the lap. Once the polymer on the material begins to flow, a hand roller shall be used to apply pressure at a right angle to the tip of the hand welder. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.
4. Smaller nozzles may be used for corners and field detailing, maintaining a minimum 1 inch weld.

C. Automatic Machine Welding:
1. Proper welding of the membrane can be achieved with a variety of automatic welding equipment.
2. Follow all manufacturers' instructions for the safe operation of the automatic welder.
3. Follow local code requirements for electric supply, grounding and surge protection.
4. The use of a dedicated, portable generator is highly recommended to ensure a consistent electrical supply, without fluctuations that can interfere with weld consistency.
5. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.

D. Inspection:
1. The job foreman and/or supervisor shall initiate daily inspections of all completed work which shall include, but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and ensure that any equipment or operator deficiencies are immediately resolved.

2. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted.

3.8 FLASHINGS

A. Clean all vents, pipes, conduits, tubes, walls, and stacks to bare metal. All protrusions must be properly secured to the roof deck with approved fasteners.

B. Provide manufacturer’s proprietary one piece, heat-weldable boot flashing at pipe penetrations. Provide stainless steel worm band at top of membrane terminations prior to sealant application.

C. The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond the wood nailers to a maximum width of 8 inches.

D. Vertical flashing shall be terminated no less than 8 inches above the plane of the deck with approved termination bar and counter-flashing or metal cap flashing.

E. Complete all inside and outside corner flashing details with pre-formed corners.

F. Probe all seams with a dull, pointed probe to ensure the weld has created a homogeneous bond.

3.9 ROOF DRAINS

A. Provide a minimum 60 mil, non-reinforced membrane for drain sumps.

B. The drain target sheet should be sized and installed to provide for a minimum of 12 inches of exposed 60 mil on all sides of the drain.

3.10 GENERAL USE SEALANTS

A. Apply authorized sealant(s) to exposed membrane terminations at pipe penetrations after installation of stainless steel worm bands.

B. Sealant(s) are to shed water. Follow all manufacturer's instructions and installation guides.

3.11 CUT EDGE SEALANTS

A. Provide manufacturer’s approved cut edge sealant at locations where reinforced membrane has been field cut and not concealed with wall cladding, etc.

B. Exposed field cuts in roof membrane shall be kept to a minimum.

3.12 TEMPORARY SEALS

A. At the end of each working day or at the sign of rain, install temporary, 100% watertight seal(s) where the completed new roofing adjoins the uncovered deck or existing roof surface.

B. If water enters beneath the newly completed roofing, the affected area(s) shall be removed and replaced at no additional expense to the building owner.

C. Prior to the commencement of work, cut out and remove all contaminated membrane, insulation, roof cement or sealant and properly dispose off site.

3.13 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.14 PROTECTION AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.15 COMPLETION

A. Remove all debris, excess materials and scrap of any kind from the roof and surrounding premises prior to demobilization.

B. Inspect all field welds, detailing and terminations to ensure a 100% the watertight installation.

3.16 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect building surfaces against damage from roofing Work.

C. Where traffic must continue over finished roof membrane, protect surfaces.

3.17 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Flashings and counterflashings, reglets, sheet metal parapet coping and fabricated sheet metal items as indicated on the drawings.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
1. None.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 46 00 - Fiber Cement Siding.
3. Section 07 53 03 - Elastomeric Membrane Roofing.
4. Section 07 71 00 - Roof Specialties.
5. Section 07 71 23 - Manufactured Gutters and Downspouts.
6. Section 07 90 00 - Joint Protection.
7. Section 09 91 13 – Exterior Painting and Coating.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. ASTM International:
1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. ASTM A625/A625M - Standard Specification for Tin Mill Products, Black Plate, Single Reduced.
3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

5. ASTM B32 - Standard Specification for Solder Metal.
6. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
7. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
8. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
9. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

C. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

D. Sheet Metal and Air Conditioning Contractors: SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action submittals:
1. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
2. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.
3. Samples: Submit four samples 4"x4" in size illustrating metal finish color.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. Informative Submittals:
1. Product Data: provide Environmental Product Declaration if available.

1.4 QUALITY ASSURANCE

A. Mock up: per section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend site meeting and furnish materials for mockup.

B. Qualifications:
1. Fabricator and Installer: Company specializing in sheet metal work with minimum three years experience.

1.5 WARRANTY

A. Work of this Section is subject to two-year warranty. Provide manufacturer's standard warranty on factory finished metal products for resistance to color change, chalk, fade and corrosion.

B. Provide fabricator/installer's two-year warranty against defective materials and workmanship. Warranty to cover repair or replacement of work of this Section plus associated building materials, without additional cost to Owner, for water damage resulting from failures of products or installations of work of this Section

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials causing discoloration or staining.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM

A. Pre-Finished Galvanized Steel Sheet: ASTM A653 prime commercial quality steel sheet, G90 zinc coating (1.25 oz. per sf); 24 gauge core steel unless otherwise noted, shop pre-coated with three coat fluoropolymer finish.
   1. Finish to match adjacent sheet metal siding or roofing.

B. TPO-clad metal copings, flashings, and accessories as required by roofing manufacturer.

C. Stainless Steel: ASTM A167, Type 304 or Type 316; 26 gauge unless otherwise noted.

D. Pre-primed Galvanized Steel Sheet: ASTM A653 prime commercial quality steel sheet, G90 zinc coating (1.25 oz. per sf); 24 gauge core steel unless otherwise noted, shop primed for field painting.

E. Gutters and downspouts: refer to Section 07 71 23.

2.2 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers. Provide color matched fasteners for pre-finished flashing.

B. Sealant: sealant specified in Section 07 90 00.

C. Plastic Cement: ASTM D4586, Type I.

D. Reglets: Surface mounted type, 24 ga. galvanized steel manufactured by Fry Reglet Corp., Springlock flashing system, Type SM for surface mounted applications, field painted.

E. Solder: ASTM B32; type suitable for application and material being soldered.

2.3 FABRICATION

A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet metal, interlocking with sheet.

C. Form pieces in longest possible lengths, allowing for temperature-related expansion and contraction.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch long legs; solder for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip, or as otherwise detailed on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets to lines and levels indicated on Drawings. Seal top of reglets with sealant.

C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Insert flashings into reglets to form tight fit.

B. Secure flashings in place using concealed fasteners wherever possible. Use exposed fasteners only where permitted or shown on drawings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Treat any contact surfaces of dissimilar metals to prevent electrolytic corrosion.

E. Fabricate and install with shapes true to line, corners square and sharp, and edges hemmed and neat. Torch cutting not allowed. Surfaces to be free of waves and buckles.

F. Allow for thermal expansion and contraction in accordance with Manual. Runs typically 30 feet maximum.

G. Butt joints in flashing shall be protected with 8” backing splice plate. Seal plate to flashing with non-skinning butyl sealant. Splice plate shall match flashing material and finish.

H. Horizontal Joints for parapet coping shall be standing seam.

I. Make exterior work water-tight.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Manufactured flashing products for miscellaneous electrical and piping penetrations, and curbs for mechanical equipment.
   2. Roof anchors.

B. Section includes for Armory building:
   1. N/A.

C. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

D. Project Specific Requirements: None.

E. Related Sections:
   1. Section 07 53 03 - Elastomeric Membrane Roofing.
   2. Division 22.
   3. Division 23.

1.2 REFERENCES

A. ASTM International: ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

B. National Roofing Contractors Association: NRCA - The NRCA Roofing and Waterproofing Manual.

C. Sheet Metal and Air Conditioning Contractors: SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on shape of components, materials and finishes, anchor types and locations.

C. Manufacturer's Installation Instructions: Submit instructions for special procedures and perimeter conditions requiring special attention.

D. MSDS Materials: Include material safety and data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA and NRCA details.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five-year manufacturer warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install according to manufacturer’s written instructions.

B. Install when ambient temperature, humidity, and other environmental conditions are within range allowed by manufacturer.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination

PART 2 PRODUCTS

2.1 PENETRATION FLASHING

A. Manufacturer:
   1. Elmdor / Stoneman Manufacturing Co.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Storm-tite Seamless Lead Roof Flashing Assembly: Vandal-proof hood, low silhouette, model no. 1100-3. Assembly features 4 lb. lead x 8" skirt, vented top, suitable for one vent pipe, sizes 1.5" through 4", caulk-type for CI soil and SPS pipe.

C. Storm-tite Seamless Lead Multi-Flash Assembly, suitable for up to 4 conduits or service lines with openings 1/8" to 2" size.

D. Storm-tite Seamless Lead Roof Flashing Assembly, similar models available for pipe or conduit sizes other than noted above.

E. Sealant: Manufacturer's standard type suitable for use with installation of system; non-staining, non-shrinking, and non-sagging; ultra-violet and ozone resistant; color as selected.

F. Finishes: Manufacturer's standard.

2.2 ROOF CURB

A. Manufacturer:
   1. Greenheck Manufacturing Co.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Prefabricated roof curbs: 18 gauge galvanized steel or .064 aluminum as required. Welded seam. Rigid insulation.

2.3 ROOF ANCHOR

A. Manufacturer:
1. Super Anchor Safety Co.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Prefabricated roof anchors: CRA Commercial Roof Anchor CRA-18.
1. Fastener Pack N 2022.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify deck, curbs, roof membrane, base flashing, and other items affecting Work of this section are in place and positioned correctly.

C. Verify that vent pipes are proper height for the flashing assembly used.

3.2 INSTALLATION OF PENETRATION FLASHING

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

C. Install each item as appropriate to type, size and number of pipe, conduit, or service line penetrations through the roof deck.

3.3 INSTALLATION OF ROOF ANCHORS

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

C. Install in locations capable of supporting 5,000 lbs of load.

D. Install anchors onto ¾” plywood. For plywood less than ¾” a ¾” backer is required.

E. Locations: allow for four roof anchors on main roof.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Pre-finished steel conductors and downspouts. Provide precast concrete splash blocks where needed.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Related Sections:
   1. Section 07 46 13 – Metal Roofing.
   2. Section 07 53 03 - Elastomeric Membrane Roofing.
   3. Section 07 62 00 - Sheet Metal Flashing and Trim.
   4. Section 07 90 00 - Joint Protection.

1.2 REFERENCES

A. ASTM International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   3. ASTM B32 - Standard Specification for Solder Metal.

B. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

C. Sheet Metal and Air Conditioning Contractors: SMACNA - Architectural Sheet Metal Manual

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action submittals:
   1. Product Data: Submit data on manufactured components, materials, and finishes.
   2. Samples: Submit four samples, 4"x4" illustrating component color and finish.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. Informative Submittals:
   1. Product Data: provide Environmental Product Declaration if available..

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Manual.

B. Mock up: per section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds

B. Furnish five-year manufacturer warranty for gutter and downspout finishes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

1.7 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS

A. Base Materials:
1. Conductors and scuppers: Pre-finished sheet metal, SMACNA profile.
2. Gutters: Pre finished sheet metal, SMACNA profile. Approximately 6” x 6” section. See drawings.
3. Downspouts: Sheet metal; 4” diameter circular pipe fabricated to SMACNA standards.

B. Locations: Where indicated on drawings. Locations include:
1. Level 1 sloped roofs at entries.

2.2 COMPONENTS

A. Pre-Finished Steel Sheet: same as Section 07 42 13 - Metal Siding; 24 gauge with DuraTech premium floropolymer coating
1. Color to match sheet metal siding or as selected by Architect.

2.3 ACCESSORIES

A. Connectors: Manufacturer's standard, same material as gutter and downspout.

B. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with SMACNA requirements. For aluminum, type recommended by fabricator.
   2. Gutter Supports: Spikes and ferrules.
   3. Downspout Supports: Straps.

C. Fasteners: Prefinished steel, same material and finish as gutters and downspouts, with soft neoprene washers.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Fabricate with required connection pieces.

C. Form sections to shape indicated, square, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate downspouts with a turn-out at the bottom. Seal watertight to downspout body.

F. Fabricate gutter and downspout accessories; seal watertight.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify surfaces are ready to receive gutters and downspouts.

3.2 INSTALLATION

A. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

B. Slope gutters sufficiently to assure positive drainage toward outlet at downspout.

C. Attach downspouts to wall so that bottom turn-out is 6" above splash block.

D. Set splash blocks under downspouts, resting unsecured on roofing membrane.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Firestopping materials and accessories.
   2. Firestopping tops of fire rated walls.

B. Performance Requirements:
   1. Conform to IBC, FM, or UL standards for fire resistance ratings and surface burning characteristics as referenced in the drawings or these Specifications.
   2. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 09 21 16 - Gypsum Board Assemblies.
   2. Division 22 - Plumbing work requiring firestopping.
   3. Division 23 - HVAC work requiring firestopping.
   4. Division 26 – Electrical work requiring firestopping.

E. Definitions:
   1. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. Intertek Testing Services (Warnock Hersey Listed): WH - Certification Listings.

C. National Fire Protection Association: NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.
   2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
   3. UL 1479 - Fire Tests of Through-Penetration Firestops.
   4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
   5. UL - Fire Resistance Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action submittals:

1. Product Data: Submit data on product characteristics, performance and limitation criteria.
2. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
3. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
4. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.
5. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 B.

1.4 QUALITY ASSURANCE

A. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Qualifications:

1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
2. Applicator: Company specializing in performing Work of this section with minimum three years experience, and approved by manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F, or as otherwise indicated in manufacturer's instructions. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

C. Provide ventilation in areas to receive any solvent cured materials.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Manufacturers:
1. Hilti Corp.
2. Dow Corning Corp.
3. Grace Construction Products .
4. 3M fire Protection Products.
5. Pecora Corporation.
6. United States Gypsum Co.
7. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

C. VOC Limits:
1. See Section 01 81 13 – 2.2 B.

D. Color:
1. In concealed or unfinished locations: red.
2. In visible locations in finished space: as selected by Architect from manufacturer’s full range of colors.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent: As recommended by firestopping manufacturer.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing or damming materials if required to arrest liquid material leakage.

3.3 APPLICATION

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

D. Tool firestopping material as required by manufacturer.

E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect adjacent surfaces from damage by material installation.

3.7 SCHEDULES

A. Contractor to submit schedule for firestopping.

B. Refer to the drawings for locations and rating of fire rated assemblies.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Work includes:
   1. Furnish and install exterior sealants and associated accessories as indicated on Architectural Drawings

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. All adhesives and sealants including caulks must have VOC levels below current thresholds established by SCAQMD Rule 116B.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Division 07 – Water Resistive Barriers
   2. Division 07 – Sheet Metal Flashing and Trim
   3. Division 07 – Fiber Cement Cladding
   4. Division 07 – Metal Cladding Panels
   5. Division 07 – Adhered Thermoplastic Polyolefin Roofing
   6. Division 07 – Modified Bitumen Roofing
   7. Division 08 – Glazed Aluminum Window Wall
   8. Division 08 – Glazed Aluminum Curtain Wall
   9. Division 08 – Vinyl Framed Windows and Doors
   10. Division 08 – Aluminum Storefronts and Entrances

1.2 REFERENCES

A. ASTM C834 – Specification for Latex Sealing Compounds

B. ASTM C804 – Specification for the use of Solvent-Release Type Sealants

C. ASTM C790 – Specification for the use of Latex Sealing Compounds

D. ASTM C1193 – Standard Guide for Use of Joint Sealers

E. ASTM C920 – Standard Specification for Elastomeric Joint Sealant

F. Sealant, Waterproofing and Restoration Institute (SWRI) – Sealants: The Professional's Guide (industry handbook)

1.3 SUBMITTALS:

A. Before commencement of the Work, provide to the Architect/Consultant the following:
   1. Product literature including Technical Data Sheets (TDS) for all sealants and accessories
   2. Manufacturer's published installation instructions.
   3. Samples for Architect's selection, including manufacturer's standard colors.

4. Test reports: Pertinent test reports indicating compatibility with intended substrates and materials.
5. Product Data: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 B.

B. ESDS Binder:
1. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants per Section 01 81 13 – 1.6 D 14. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 B.

1.4 QUALITY ASSURANCE

A. Installer/Tradesmen involved in the Work of this Section shall have a minimum 5-years' documented experience regarding the installation of joint sealants.

B. Mock Up: Construct a mock-up of each typical condition to show location, joint preparation, size, shape and depth of joints complete with back-up material, primer, and sealant per specification section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend site meeting and furnish materials for mockup

C. Pull Test: Contractor shall prepare an empirical pull test to be performed by the Building Envelope Consultant on an approximate 12"-long specimen of each sealant on every applicable substrate. Requirements as follows:
2. Adhesion: As pulled away from joint in a 90-degree direction (perpendicular to joint), bond adhesion of specimen to joint substrate shall be capable of resisting pull forces as required to complete duration of test.
3. Elongation and Cohesive Tear Resistance: As specimen is resisting pull force adhesively, specimen shall reach +/- 300% elongation prior to rupture (cohesive failure).
4. Specimen shall be deemed suitable if at cohesive failure point, adhesion remains at substrate. Failure of specimen to reach 300% elongation or adhesion debonding at any time from substrate will be deemed an unacceptable installation.

1.5 WARRANTY

A. Section 01 70 00 – Executing and Closeout Requirements: Product warranties and product bonds.

B. One-year standard warranty on product and workmanship.

1.6 DELIVERY, HANDLING AND STORAGE

A. Deliver and store materials in original wrappings and containers with manufacturer's seals, labels and batch/serial numbers intact and legible.

B. Protect from freezing, moisture, water and damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install according to manufacturer's written instructions.

B. Install when ambient temperature, humidity, and other environmental conditions are within range allowed by manufacturer.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination.

PART 2 PRODUCTS

2.1 GENERAL

A. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, with joint substrates, and with materials in close proximity under use conditions, as demonstrated by sealant manufacturer by testing and related experience.

B. Joint Sealant Standard: Comply with ASTM C 920 and other specified requirements for each liquid-applied joint sealant.

C. Any sealant that remains exposed or that will be in direct contact with porous materials to remain exposed upon project completion shall be non-staining.

D. Stain Test Characteristics: Where sealants are required to be non-staining, provide sealants tested per ASTM C 1248 as non-staining on porous joint substrates indicated for the Project.

E. Primers: Provide and use primers in strict accordance with manufacturer's instruction where required.

F. Sealants within system assemblies, as recommended by the manufacturer, shall be capable of suiting the purpose intended and compatible with adjacent materials.

G. Sealants shall exhibit no chalking or cracking resulting from exposure to heated aging, per ASTM C792.

2.2 MANUFACTURERS

A. DOW Corning Corporation

B. General Electric Company (GE)

C. Tremco Commercial Sealants and Waterproofing, Inc.

D. BASF Chemical Company

E. Henkel Corporation (OSI)

2.3 SILICON SEALANTS

A. **JS-#1**, single-component, ultra-low-modulus, non-sag, neutral-curing silicone joint sealant
   1. Basis of Design Product:
      a. DOW Corning 790 Silicone Building Sealant
      b. GE Silglaze II SCS2800
   2. Tremco Spectrum 1
   3. ASTM C 920, Type S, Grade NS, Class 100/50, for Use T, NT, M, G, A, and O
   4. Staining, ASTM C 1248: None on concrete, granite, limestone, and brick
   5. Hardness, ASTM C 661: 15 durometer Shore A
   6. Volatile Organic Compound (VOC) Content: 26 g/L maximum
   7. Color: **As selected by Architect from manufacturer's full line of colors.**

B. **JS-#2**, single-component, medium modulus, non-sag, neutral-curing silicone joint sealant
   1. Basis of Design Product:
      a. DOW Corning 756 SMS Building Sealant
   2. ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, M, A, and O
   3. Staining, ASTM C 1248: None on white marble
   4. Hardness, ASTM C 661: 35 durometer Shore A, minimum
   5. Volatile Organic Compound (VOC) Content: 60 g/L maximum
   6. Color: **As selected by Architect from manufacturer's full line of colors**

C. **JS-#3**, single-component, medium modulus, non-sag, neutral-curing silicone joint sealant
   1. Basis of Design Product:
      a. DOW Corning 795 Silicone Building Sealant
      b. GE SCS 2000 SillPruf
      c. Tremco Spectrum 2
   2. ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, A, and O
   3. Staining, ASTM C 1248: None on concrete, marble, granite, limestone, and brick
   4. Hardness, ASTM D 2240: 35 - 45 durometer Shore A, minimum
   5. Volatile Organic Compound (VOC) Content: 32 g/L maximum
   6. Color: **As selected by Architect from manufacturer's full line of colors**

D. **JS-#5**, Single-component, neutral cure silicone sealant designed for adhering to low energy surfaces
   1. Basis of Design Product:
      a. DOW Corning 758 Silicone Weather Barrier Sealant
      b. Tremco Tremsil 400
   1. ASTM C920 Type S, Grade NS, Class 25, Use G, A, and O
   2. Color: **As selected by Architect from manufacturer's full line of colors**

2.4 MODIFIED POLYMER SEALANTS

A. **JS-#6**, A low-modulus, single-component, moisture-cure, polyurethane hybrid (silyl-modified polymer) sealant
   1. Basis of Design Product:
      a. Tremco Dymonic FC
      b. BASF Masterseal NP 150
   2. ASTM C 920, Type S, Grade NS, Class 35, Use NT, M, A, and O
   3. Color: **As selected by Architect from manufacturer's full line of not less than 10.**

B. **JS-#8**, single-component non-sag thermoplastic sealant. Blend of elastomeric polymers and synthetic resins.
   1. Basis of Design Product
      a. OSI Sealants Pro Quad Series Advanced Formula Sealant
   1. ASTM C 920: Type S, Grade NS, Class 25, Use NT
   2. Color: **As selected by Architect from manufacturer's full line of colors.**

2.5 BUTYL SEALANTS: FOR USE WITHIN UNITIZED GLAZING SYSTEMS.

A. **JS-#9,** single-component; Shore A hardness of 10-20. black color, non-skinning; compatible for use with glazing sealant

2.6 ACCESSORIES

A. Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.
   1. Necessity of primer shall be determined by preconstruction joint sealant-substrate tests and field tests.

B. Cylindrical Sealant Backing: Provide sealant backings of material and type that are non-staining, are compatible with joint substrates, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.
   2. Extruded closed cell polyurethane, neoprene or vinyl foam backer rod as required to maintain proper sealant geometry per sealant manufacturer.
   3. Size: Diameter of backer rod shall be 1/3 times greater than width of joint where it is to be installed or as otherwise recommended by manufacturer of backer rod.

C. Bond Breaker Tape: Polymer tape compatible with joint sealant materials and recommended by sealant manufacturer.

D. Joint Cleaner: Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

PART 3 EXECUTION

3.1 PROTECTION

A. Protect installed work of other trades, and adjacent surfaces from staining or contamination.

3.2 PREPARATION OF JOINT SURFACES

A. Examine joint sizes and conditions to establish correct depth-to-width relationship for installation of backup materials and sealant.

B. Clean bonding joint surfaces of harmful matter substances, including but not limited to dust, rust, oil, grease, coatings, existing sealant, and all other foreign matter that may adversely affect sealant adhesion and performance.

C. Do not apply sealant to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

D. Ensure joint surfaces are dry and frost free.

E. Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

F. Prepare surfaces in accordance with manufacturer’s directions.

3.3 PRIMING

A. Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to backing and caulking.

B. Prime only as much area as can be sealed in the same day.

3.4 BACKUP MATERIAL

A. Install backing rod or joint filler, as approved by manufacturer, to achieve a joint depth and shape ratio of 2:1 and approximately 25% compression. Install backer rod without stretching, twisting, braiding, puncturing, or damaging outer skin.

B. Where constraints prevent use of backer rod, install bond breaker tape where required to prevent 3-sided adhesion and to manufacturer's instructions.

3.5 APPLICATION

A. Follow manufacturer's published installation instructions for sealant application and geometry.

B. Apply sealant in strict accordance with manufacturer's printed application instructions.

C. Mask edges of joint where irregular surface or sensitive joint border exists, to provide neat joint.

D. Apply sealant in continuous beads.

E. Apply sealant using gun with proper size nozzle.

F. Use sufficient pressure to fill voids and joints solid.

G. Form surface of sealant with full bead, smooth and free from ridges, wrinkles, sags, air pockets, and embedded impurities.

H. Tool exposed surfaces before skinning begins, to give slightly concave and uniform shape.

I. Minimum sealant joint width to be 3/8". Minimum sealant depth to be 1/4".

J. Minimum fillet beads to be 3/8" x 3/8", with bond breaker used at all exterior joint locations.

K. Remove excess compound promptly as work progresses and upon completion.

L. Seal air and vapor barrier sheet and lap joints as follows:
   1. Apply continuous bead of sealant to substrate. Ensure no gaps exist in sealant bead.
   2. Lap sheet over sealant and press into sealant bead to ensure proper and continuous bond between sheets.
   3. Smooth out folds and ripples occurring in sheet over sealant.
   4. Only seal vapor barrier sheets at locations shown on drawings.

3.6 CURING

A. Cure sealant in accordance with sealant manufacturer's instructions.

B. Do not cover up sealant until proper curing has taken place.

3.7 CLEANING

A. Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.

1. Remove masking tape immediately after tooling joint without disturbing seal.
2. Remove excess sealant from non-porous surfaces while still uncured.

3.8 FIELD QUALITY CONTROL

A. Field Adhesion Testing: Installer shall perform adhesion tests in accordance with manufacturer's instructions and with ASTM C 1193, Method A – Field-Applied Sealant Joint Hand-Pull Tab.
   1. Perform 5 tests for first 1,000 feet of joint length for each kind of sealant and joint substrate, and 1 test for each 1,000 feet of joint length thereafter – or 1 test per each floor per building elevation, minimum.
   2. For sealant applied between dissimilar materials, test both sides of joint.

B. Remove sealants failing adhesion test, clean substrates, reapply sealants, and re-test. Test adjacent sealants to failed sealants.

C. Submit report of field adhesion testing indicating tests, locations, dates, results, and remedial actions taken.

3.9 JOINT SEALANT SCHEDULE

A. Exterior joints in cast-in-place concrete
   1. JS-#1

B. Movement joint in concrete masonry units, brick masonry, and stone masonry
   1. JS-#1, JS-#2, or JS-#3 as recommended by sealant manufacturer

C. Exterior joints in metal panel
   1. JS-#2

D. Exterior sealant at fiber cement, wood, and other cladding (field paint)
   1. JS-#6

E. Exterior sealant joints for air barrier continuity at water-resistive/air barrier
   1. JS-#5
   2. Other as recommended by WRB manufacturer for their system

F. Sealants for air barrier continuity (interior perimeters of fenestrations)
   1. JS-#5

G. Sealants at metal flashing laps
   1. JS-#3

H. Sealants at masonry, stone, and concrete joints
   1. JS-#3

3.10 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 11 15

METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pre-assembled steel frames and doors; interior and exterior locations; fire rated and non-fire rated assemblies.
2. Pre-assembled steel relites; interior locations, non-fire rated assemblies.

B. Performance Requirements:
1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
2. Performance requirements for exterior doors:
a. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with applicable code.
b. Thermal Transmittance of Assembly: Maximum U-Value of 0.20 Btu/sq ft per hour per deg F when measured in accordance with AAMA 1503 or NFRC 100.
c. Water Leakage: None, when measured in accordance with ASTM E331 and ASTM E547.
d. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with pane of glass and heel bead of glazing compound.
3. Performance requirements for fire rated doors:
a. Fire rated assemblies: Complying with NFPA 90 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, based on testing at positive pressure according to NFPA 252 or UL 10C.
b. Smoke and draft control assemblies: provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
c. Attach label from agency approved by authority having jurisdiction to identify each fire rated door and frame.

C. Project Specific Requirements:
1. Exterior doors to be filled with low-expanding spray foam to maintain air barrier.

D. Related Sections:
1. Section 04 20 00 - Unit Masonry.
2. Section 06 20 00 - Finish Carpentry.
3. Section 08 14 16 - Flush Wood Doors.

4. Section 08 71 00 - Door Hardware.
5. Section 08 80 00 - Glazing.
6. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
   1. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
   2. American National Standards Institute: ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.

B. American Society of Civil Engineers: ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
   5. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
   6. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
   7. ASTM C1036 - Standard Specification for Flat Glass.

D. Consumer Product Safety Commission: CPSC 16 CFR 1201; Safety Standard for Architectural Glazing.

E. Glass Association of North America: GANA - Glazing Manual.

F. National Fire Protection Association:
   1. NFPA 80 - Standard for Fire Doors, Fire Windows.
   2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
   3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

G. National Fenestration Rating Council Incorporated: NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

H. Underwriters Laboratories Inc.:
   1. UL 10B - Fire Tests of Door Assemblies.
   2. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
   3. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
   4. UL 1784 - Air Leakage Tests of Door Assemblies.

I. Building Code: UBC Standard 7-2 - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Action Submittals:
1. Shop Drawings: Indicate elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware and other details.
2. Product Data: Submit frame and door configurations, core materials, thermal resistance and finishes. Submit schedule using same reference numbers for doors, details and openings as those on Drawings.
3. Qualifications: verify qualifications of manufacturer and installer.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform glazing Work in accordance with the following:
1. Insulated Glass: Fabricate insulated glass units in accordance with GANA (formerly FGMA) Glazing Manual.
2. Safety Glass: Conform to ANSI Z97.1, CPSC 16 CFR 1201, and applicable codes.

B. Surface Burning Characteristics: Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Qualifications:
1. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
2. Installer: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

D. Field Measurements: verify field measurements prior to fabrication.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept units on site in manufacturers standard packaging. Inspect for damage.

C. Protect units from damage by storing in dry, protected area.

D. Break seal on site to permit ventilation.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate work with door opening construction and door hardware installation.

C. Coordinate installation to accommodate door hardware electric connections.

PART 2 PRODUCTS

2.1 PRE-ASSEMBLED STEEL DOORS AND FRAMES (noted as "HM" on Door Schedule)

A. Manufacturers:
1. Ceco Door Products.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Metal Frames, Interior Openings: 16 gauge steel sheet for openings up to 36" wide, 14 gauge for openings over 36" wide. Sizes, profiles, and fire ratings as indicated on Drawings.
1. Series SQ Steel Frames by Ceco Door.

C. Metal Frames, Exterior Openings in wood framed walls: 16 gauge steel sheet for openings up to 36" wide, 14 gauge for openings over 36" wide. Sizes, profiles, and fire ratings as indicated on Drawings.
1. Mercury Thermal Break hollow metal frame by Ceco Door.
2. 1 ½" wide flange and 1" wide return on the exterior side of the profile, kerfed to accept removable weather stripping.
3. U-value per door schedule.
4. Exterior door frames for doors with air barrier detailing noted on door schedule to be filled with spray foam per 07 21 19.

D. Metal Doors: 18 gauge face thickness, flush unless otherwise shown, complying with SDI-100 for minimum materials and construction requirements, SDI Type II, Style 3; provide top channel for all exterior applications; sizes, profiles, and fire ratings as indicated on the drawings. Hot-rolled steel sheets and strips, commercial quality carbon steel, pickled and oiled, complying with ASTM A568 and A569.
1. Cold-rolled steel sheets, commercial quality carbon steel complying with ASTM A366 and A568.
2. Supports and anchors: fabricated of not less than 18 gauge galvanized steel sheet.
3. Insulation: Polyurethane. U-value for exterior locations 0.20 or better.

E. Glazing:
1. Insulating Glass for exterior applications: Sealed double pane units with Low E coating conforming with requirements in Section 08 80 00.
a. Clear, fully tempered safety glass.
2. Single Pane Vision Glass for interior applications: conforming with requirements in Section 08 80 00.
a. Single pane of clear, fully tempered safety glass.
3. Glazing Materials: Manufacturer’s standard conforming with requirements specified in Section 08 80 00.

F. Finish for doors and frames:

1. Oven-cured neutral color primer paint.
2. Primer Coat conforms with ANSI A250.10.
3. Field painted.

G. Hardware: Specified in Section 08 71 00.

2.2 PRE-ASSEMBLED STEEL RELITES

A. Manufacturers:
1. Ceco Door Products.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Metal Frames, Interior Openings: 16 gauge steel sheet; sizes, profiles, and fire ratings as indicated on Drawings.

C. Cold-rolled steel sheets, commercial quality carbon steel complying with ASTM A366 and A568.

D. Supports and anchors: fabricated of not less than 18 gauge galvanized steel sheet.

E. Finish: smooth textured factory primer for field-applied painting.

2.3 ACCESSORIES

A. Door Casings: As shown on the drawings.

B. Grilles: Manufacturer's standard fixed type; pattern indicated on Drawings.

C. Bituminous Coating: Non-asbestos fibered asphalt emulsion.

D. Primer: Manufacturer's standard rust inhibitive type.

2.4 FABRICATION

A. Fabricate hollow metal doors and frames as pre-hung single piece jamb units.

B. Fabricated units to be rigid, neat in appearance, free from defects, warp or buckle. Fabricate exposed faces of doors and panels from only cold-rolled steel. Fabricate frames, concealed stiffeners, reinforcements, edge channels and molding from either cold-rolled or hot-rolled steel (fabricator's option).

C. Fabricate frames with double rabbet, with 1-15/16" face and 5/8" returns. Fabricate frames of welded construction, exposed welds ground smooth, all corners mitered.
1. Exterior door frames for doors with a required U-value of 0.20 to be thermally broken frames.

D. Fabricate pre-hung units with hardware reinforcement welded in place.

E. Configure exterior frames to accept weatherstripping.

F. Factory glaze doors and sidelights.

G. Fire Labeled Doors and Frames: Where doors are noted on the drawings to carry an hourly fire resistance rating, provide doors and frames constructed, tested, and approved by an agency according to the requirements of ASTM E 152. If any door or frame specified or shown on documents to be fire rated cannot qualify for appropriate labeling due to design configuration, hardware, or any other reason notify the Architect and obtain approval of required modifications before commencing fabrication of the unit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify framed openings are correct size and thickness and project conditions are acceptable.

C. Correct unacceptable conditions before proceeding with installation.

3.2 PREPARATION

A. Apply one coat of bituminous paint to interior of metal frames to be in contact with cementitious materials.

3.3 INSTALLATION

A. Install units in accordance with manufacturers installation instructions.

B. Install doors and frames plumb, level and square.

C. At exterior openings, install frames with head and jamb sections as shown on the drawings, ready for the application of flashing materials.
   1. Fill frames at exterior openings with low-expanding spray foam per section 07 21 19.

D. Anchor doorframes securely.

E. Coordinate installation of hardware specified in Section 08 71 00.

F. Field Finishing: As specified in Section 09 90 00.

3.4 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.5 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Adjust door and frame units to ensure smooth and balanced movement.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Flush wood doors and wood frames; flush and flush glazed configuration with louvers as scheduled; fire rated and non-rated as scheduled.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
1. All wood doors to be solid core.

D. Related Sections:
1. Section 06 20 00 - Finish Carpentry.
2. Section 08 11 15 - Hollow Metal Doors and Frames.
3. Section 08 71 00 - Door Hardware.
4. Section 08 80 00 - Glazing.
5. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. American National Standards Institute: ANSI A135.4 - Basic Hardboard.

B. Architectural Woodwork Institute: AWI - Quality Standards Illustrated.

C. Hardwood Plywood and Veneer Association: HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

D. Intertek Testing Services (Warnock Hersey Listed): WH - Certification Listings.

E. National Electrical Manufacturers Association: NEMA LD 3 - High Pressure Decorative Laminates.

F. National Fire Protection Association:
1. NFPA 80 - Standard for Fire Doors, Fire Windows.
2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

G. Underwriters Laboratories Inc.:
1. UL - Building Materials Directory.
2. UL 10B - Fire Tests of Door Assemblies.
3. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
4. UL 1784 - Air Leakage Tests of Door Assemblies.

H. Building Code: UBC Standard 7-2 - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:

1. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.
2. Product Data: Submit information on door core materials and construction, and on veneer species, type and characteristics.
3. Samples: Submit two samples of door veneer, 8x10 inch in size illustrating wood grain, stain color, paint color and sheen.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AWI's, AWMAC's and WI's "Architectural Woodwork Standards".
   1. F Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Fire Rated Door and Panel Construction: Conform to NFPA 252.

C. Installed Fire Rated Door and Panel Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.

D. Smoke and Draft Control Doors: Tested in accordance with UL 1784. Air Leakage: Maximum 3.0 cfm/sf of door opening with 0.10 inch water gage pressure differential.

E. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.

F. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

C. Furnish manufacturer's "Life of Installation" warranty for interior and exterior doors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Package, deliver and store doors in accordance with AWI Section 1300.

C. Accept doors on site in manufacturer's packaging. Inspect for damage.

D. Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges when stored more than one week. Break seal on site to permit ventilation.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with door opening construction, door frame and door hardware installation.

PART 2 PRODUCTS

2.1 FLUSH WOOD DOORS

A. Manufacturers:
1. Lynden Door.
2. Marshfield Door systems (Weyerhaeuser).
3. Simpson Door.
4. Jeld-Wen, Inc.

B. Product Description: Solid core flush wood doors as scheduled; wood veneer facing material; fire rated and non-rated types; flush design; factory pre-fit; shop finished; sound rated wood doors.
1. Flush Interior Doors: 1-3/4 or 1-3/8 inches thick per the schedule; solid, five-ply construction, fire rated as indicated on Drawings.
2. Edges: Close grain pre-finished hardwood.
3. Acoustic Rating: STC 26 for installed unit entry doors.

C. Finish: .
1. Transparent finish typical UNO.
2. Factory stain where indicated as “Stained” on drawings.
3. Painted finish where indicated as “Painted” on drawings.

2.2 WOOD FRAMES

A. Solid Wood Frames: Nominal 1 inch thick, pre-finished solid Hemlock, 1HPA Standard Grade.

B. Finish: Transparent finish typical. Factory stain to match factory stained doors.

C. Mill to size and configuration shown on the drawings. In single or double rabbet profile, allow dimension at the face of the stop for the installation of smoke gasketing.

2.3 COMPONENTS

A. Solid Core Doors, Non-Rated: AWI Section 1300, Type PC - Particleboard.

B. Solid Core, Fire Rated: AWI Section 1300, rating as noted on the schedule.

C. Interior Veneer Facing: AWI Premium quality wood, rotary-cut, pre-finsihed White Birch, for transparent finish.

D. Cross Banding Behind Laminate Finish: manufacturer's standard construction.

2.4 ACCESSORIES

A. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style and tamper proof screws.

2.5 FABRICATION

A. Fabricate doors in accordance with AWI Quality Standards requirements.

B. Furnish lock blocks at lock edge and top of door for closer for hardware reinforcement.

C. Vertical Exposed Edge of Stiles: Of same species as veneer facing for transparent finish.

D. Fit door edge trim to edge of stiles after applying veneer facing.

E. Bond edge banding to cores.

F. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Furnish solid blocking for through bolted hardware.

G. Factory fit doors for frame opening dimensions identified on shop drawings.

H. Cut and configure exterior door edge to receive recessed weather stripping devices.

I. Provide edge clearances in accordance with AWI 1300.

J. Clearances: For non-fire doors, 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering; where threshold is indicated, provide 1/4" clearance from bottom of door to top of threshold.

K. Fire-Rated Doors:
   1. Install in corresponding fire-rated frames per NFPA No. 80.
   2. Clearances for fire-rated doors per NFPA No. 80.1.

2.6 SHOP CLEAR FINISHING

A. Finish work in accordance with AWI - Section 1500 Factory Finishing; Premium Quality, Transparent Type. Factory finish doors and frames in accordance with approved sample.

B. Seal door top edge with clear sealer to match door facing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify 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.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions and with AWI Quality Standards requirements.

B. Refer to Section 08 71 00 - Door Hardware for finish hardware requirements.

C. Trim non-rated door width by cutting equally on both jamb edges.

D. Trim door height by cutting bottom edges to maximum of 3/4 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

E. Install door louvers plumb and level.

F. Coordinate installation of glass and glazing specified in Section 08 80 00.

3.3 INSTALLATION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Conform to AWI requirements for fit and clearance tolerances.

C. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust door for smooth and balanced door movement.

C. Adjust closer for full closure.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 17 13

INTEGRATED METAL DOOR OPENING ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Smoke control door at elevator openings, consisting of integrated metal door opening assemblies with doors, operating hardware, accessories, and installation for a complete assembly.

B. Performance Requirements:
1. Certified to BHMA – A156.32, Integrated Door Opening Assemblies, 2015.
2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 14 21 23 - Elevator.
2. Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

A. ANSI/BHMA A156.32 – Integrated Door Opening Assemblies, 2015.

B. ANSI/UL 10C -- Positive Pressure Fire Tests of Door Assemblies, American National Standards Institute/Underwriters Laboratories, 2001.

C. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, American Society of Testing and Materials; 2004a.

D. AWI AWQS - Architectural Woodwork Quality Standards P-208; The Architectural Woodwork Institute; 8th Edition.

E. NFPA 101 – Life Safety Code, National Fire Protection Association, 2003.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies, National Fire Protection Association, 2003.

G. SDI 111 A - Recommended Steel Door Frame Details, Steel Door Institute; 2002.

H. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames, Steel Door Institute, 1997.

I. UL 1784 – Air Leakage Tests for Door Assemblies without an artificial bottom seal, Underwriters Laboratories Inc., 2001 (For Smoke Containment, Enclosed

Elevator Lobbies, Fire Service Access Elevator Lobby Doors, Hoistway Opening Protection)

J. ASME 17.1 2015 – Elevator Code (Assembly 2.11.6.3 section D)

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Shop Drawings: Indicate each door and frame condition; frame type, profile and installation detail; items of finish hardware, finishes and electrical rough-in requirements.
2. Submit certification for ANSI/BHMA 156.32
3. Submit Fire Certificate of Compliance
4. Product Data: Submit data for components.
5. Statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Manufacturer: Firm with not less than 5 years successful experience in fabrication of integrated metal door opening assemblies with full-height latch/lock and full-height hinge.

B. Supplier: Authorized distributor of manufacturer.

C. Installer: Manufacturer certified.

D. Regulatory Requirements

E. Rated door assemblies shall have been tested to meet conditions of NFPA 252 as required by NFPA 101 section 6-2.3.3.

1.5 WARRANTY

A. Integrated metal door opening assembly: Manufacturer’s standard 5 year warranty against defects in material and workmanship. Refer to Manufacturer’s published warranty.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store doors in a clear, dry ventilated space having controlled temperature and a relative humidity range between 30 and 60 percent. Stack doors flat and off the floor to prevent warpage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 – Product Requirements.

B. Do not bring door systems to site until building temperature and humidity ranges are compatible with recommended values for preservation of wood moisture content as listed by AWI AWQS. Building shall be stabilized at 30 to 60 percent humidity.

1.8 ADDED MATERIALS

A. None.

PART 2 PRODUCTS

2.1 POSTAL EQUIPMENT

A. Door Listed Manufacturer: Total Door.

B. Hardware Listed Manufacturer: Total Door.

C. Other Manufacturers:
1. Substitution request per 01 60 00.

2.2 PRODUCTS

A. Frames.
1. SafeFrame by Total Door (Add to system schedule).
2. In accordance with ANSI/SDI A250.8, SDI 111A, and SDI 112.
3. Construction: KD
4. Material: Steel, cold rolled, ASTM A1008, 16 gauge.
5. Fire Resistance Rating: Where indicated in Contract Documents for doors.

B. Frame Anchorage Devices:
1. To securely fasten to wall construction without distortion or stress. In accordance with fire resistance rating indicated in Contract Documents

C. Integrated Door Assembly:
1. Stiles: Steel, galvannealed, 16 gauge, spot welded.
2. Top and Bottom Rails: 5-1/2 inch 18 gauge steel rails
3. Cores: Solid polystyrene continuously bonded to faces.
4. Thickness: 1-3/4 inches.
5. Faces: Steel, stretcher leveled, without seams or spot welds, galvannealed 20 gauge.
6. Weld pattern: In accordance with manufactures standard details.

D. Gasketing:
1. Door System: Factory applied to locking channel
2. Frame: Factory supplied, field apply to head of frame.
3. Floor: Factory supplied Surface Smoke Seal to be field applied. (must be ordered with elevator shaft & lobby applications)

E. Finishes: Factory pre-finished, color to be selected by architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify prepared openings are ready to receive work.

C. Field Conditions:
1. Prior to commencing installation, examine parts of building structure, which are to receive door systems and component parts.
2. Report, in writing, conditions which would prevent proper execution or endanger permanency of the work to the Architect

D. Field Dimensions:
1. Where possible, verify frame tolerances before fabrication of door systems.
2. Notify Architect of variances with reviewed shop drawings.
3. Corrective measures, when necessary, shall be determined and approved prior to commencing fabrication.
4. Coordinate door opening assembly details with adjacent work to assure proper attachments, clean junctions, etc.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Install work in accordance with Contract Documents and reviewed shop drawings.

C. Installer: Manufacturer certified.

D. Integrated Door Assembly
1. Hang to maintain manufacturer’s installation tolerances.
2. Adjust to freely swing without binding, sticking, or sagging, and to eliminate excessive clearances.
3. Hardware: When installation is otherwise complete, confirm proper operation and function.

3.3 SYSTEM SCHEDULE:

A. Set: 180° Single Hold Open
1. 1 ea Full Height Hinges H-13
2. 1 ea Full Height Latch Channel L-11
3. 1 ea Operating Pulls M32
4. 1 ea Exit Device/insert to match skin PF200 (Flush Panic)
5. 1 ea Closer TDC8907
6. 1 ea Mag Holder TDH100
7. 1 ea Surface mounted smoke seal W60
8. 1 ea Positive Pressure label (confirm rating with door schedule)
9. 1 ea Vision Panel N Lite with FIRELITE NT
10. As required by ASME 17.1 Elevator Code 2015
11. 1 ea SafeFrame TDWMF

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fire resistive rated and non-rated access doors and panels with frames. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring maintenance behind inaccessible finished surfaces.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Fire rating: access doors to maintain fire rating of assembly in which it is installed.
   3. Access doors to be rated by Underwriters Laboratories.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 09 21 00 - Gypsum Board Assemblies.
   3. Section 09 90 00 - Painting and Coating.
   4. Division 22 - Plumbing.
   5. Division 23 - Heating, Ventilating, and Air Conditioning.
   6. Division 25 - Integrated Automation.
   7. Division 26 - Electrical.

1.2 REFERENCES

A. ASTM International: ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Intertek Testing Services (Warnock Hersey Listed): WH - Certification Listings.

C. National Fire Protection Association: NFPA 80 - Standard for Fire Doors, Fire Windows.

D. Underwriters Laboratories Inc.: UL - Building Materials Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit literature indicating sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining Work.

C. Manufacturer's Installation Instructions: Submit installation requirements and rough-in dimensions.

D. MSDS materials: Include material safety and data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

E. Closeout submittals:
1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
2. Project Record Documents: Record actual locations of access units.

1.4 QUALITY ASSURANCE

A. Fire Resistance Ratings: Where indicated as fire rated, provide assemblies from manufacturers listed in UL Directory.

B. Fire Rated Horizontal and Vertical Access Doors: Rating to match wall or ceiling assembly into which door is placed. Tested Rating: Determined in accordance with ASTM E119.

C. Attach label from agency approved by authority having jurisdiction to identify each fire rated access door.

D. Qualifications:
1. Manufacturer: Company specializing in manufacturing products specified with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Work of this section is subject to one year warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work with work requiring controls, valves, traps, dampers, cleanouts, and similar items requiring operation being located behind finished surfaces.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Manufacturers:
1. Nystrom Inc.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Flush Framed Access Doors (Type 1): Nystrom Flush. Frames and nominal 1 inch wide exposed flanges of 16 gage steel and door panels of 14 gage steel; latching door with standard cam lock (no key).

C. Fire Rated Access Doors (Type 2): Nystrom Uninsulated UT. Frames and nominal 1 inch wide exposed flanges of minimum 16 gage steel and door panels of 16 gage steel. 1-1/2 hour fire rating for installation in 1 or 2 hour wall. Provide self-closing and latching door with keyed cam lock.

D. Fire Rated Access Doors (Type 3): Nystrom Insulated IT. Frames and nominal 1 inch wide exposed flanges of minimum 16 gage steel and door panels of 16 gage steel. 1-1/2 hour fire rating for installation in 1 and 2 hour wall or ceiling. Provide self closing and latching door with keyed cam lock.

E. All doors to be installed with tamper proof screws.

F. All doors to be installed with keyed cam lock UNO.

2.2 FABRICATION

A. Fabricate units of continuous welded construction; weld, fill, and grind joints to assure flush and square unit.

B. Hardware:
   1. Hinge: Standard continuous or concealed spring pin type, 175-degree steel hinges.
   2. Lock: Self-latching lock. Removable wrench lift handle.

C. Size Variations: Obtain acceptance of manufacturer’s standard size units which vary slightly from sizes shown or scheduled.

2.3 LOCATIONS AND NUMBER

A. Coordinate with mechanical and electrical trades. Locate access doors wherever components of work are located behind finished surfaces, including but not limited to plumbing valves, trap primers, control devices, HVAC equipement, electrical grounds or bonds, and the like.

B. Size of access doors to suit application, but not smaller than 12" x 12".

C. Schedule: Provide the following number of access doors supplied and installed in the Base Bid. Access doors required to complete the work beyond this number will be subject to Change Order provisions in Section 01 26 00.
   1. Access Door Type 2 (mechanical shafts): size 30"x30", number: 3, locking with manufacturer’s cam lock, 1-1/2 hour fire rated. Factory Finished. Corridor pressurization shaft in rooms 218, 318, 418.
   2. Access Door Type 2 (Dryer exhaust cleanout): size 16”x16”, number: 6, locking with manufacturer’s cam lock, 1-1/2 hour fire rated. Factory finished. Two per each laundry room 219, 319, 419.
   3. Access Door Type 1 (Water meter): size 12”x12”, number 54, locking with manufacturer’s cam lock, non-rated. If located in fire-rated wall a type 2 access door shall be used. Factory finished. See 1/P0.05.

2.4 SHOP FINISHING

A. Finish: Factory finish with two coats baked enamel, color as selected by Architect from standard line.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough openings for access doors and panels are correctly sized and located.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Secure frames rigidly in place, plumb and level in opening, with plane of door and panel face aligned with adjacent finished surfaces. Set concealed frame type units flush with adjacent finished surfaces.

C. Position unit to provide convenient access to concealed work requiring access.

D. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

E. Install all access panels with tamper proof screws.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Aluminum-framed storefront windows.
2. Aluminum and glass entrances.
3. Glass and glazing.
4. Related flashings, anchorage and attachment devices.

B. Performance Requirements:
1. Structural: Test according to ASTM E 330 as follows:
a. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
b. Test duration: As required by design wind velocity, but not less than 10 seconds.
2. Deflection: Limit mullion deflection to 1/175 for spans under 11’-6” and 1/240 plus 1/4 inch for spans over 11’-6” of span; with full recovery of glazing materials.
3. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at reference differential pressure across assembly of 1.57 psf as measured in accordance with AAMA 501 or ASTM E283.
4. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
5. Vapor Seal: Limit vapor seal with interior atmospheric pressure of 1 inch sp, 72 degrees F, 40 Percent RH without seal failure.
6. Condensation Resistance Factor: CRF of not less than 50 when measured in accordance with AAMA 1503.
7. Water Leakage: None, when measured in accordance with ASTM E331 at 10.00 lb/sq ft.
8. Thermal Transmittance of Assembly (Excluding Entrances): Maximum U Value of 0.60 when measured in accordance with AAMA 1503 or NFRC 100. SHGC of 0.38.
9. Acoustic Performance: Minimum STC rating of 38 for all windows facing Fruitvale Blvd.
10. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
1. None.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry: Wood framed openings.

2. Section 07 27 00 - Air and Water Barriers.
3. Section 07 65 00 - Self-Adhering Sheet Flashing
4. Section 07 92 00 - Joint Sealants.
5. Section 08 71 00 - Door Hardware.
6. Section 08 80 00 - Glazing.
7. Section 12 20 00 - Window Treatments.

1.2 REFERENCES

A. Aluminum Association: AA DAF-45 - Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association:
1. AAMA 501 - Methods of Test for Exterior Walls.
2. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
3. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
4. AAMA MCWM-1 - Metal Curtain Wall Manual.
5. AAMA SFM-1 - Aluminum Store Front and Entrance Manual.

C. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. National Fenestration Rating Council Incorporated: NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Storefront Product Schedule to indicate:
   a. Manufacturer
   b. Model number
   c. Type
   d. Design Pressure Rating
   e. U-factor
   f. SHGC
   g. CRF value
   h. Size
   i. Frame Color
   j. Glazing type
   k. Vent / no vent
   l. CPD Number
2. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.
3. Product Data: Submit component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
4. Samples: Submit two samples 6 x 6 inches in size illustrating finished aluminum surface.

5. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
   a. Air Infiltration and water penetration as noted in Section 1.1B.
   b. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
      1) No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential
6. NFRC Certificate: For each separate type of product of this Section, provide the NFRC Label Certificate for Site-Built Products, listing the Project Location, Product Line Information, Frame Material Supplier, Glazing Material Supplier, Glazing Contractor/Installer, Certification Authorization, and Inspection Agency with signature, and stating the Energy Performance Ratings for U-factor, solar heat gain coefficient, and visible light transmittance value.

C. ESDS Binder:
1. Include manufacturer's product information showing compliance with VOC limits under Criterions 6.1 per spec section 01 81 13 – 1.6 C 12.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Window assemblies must be NFRC certified.

C. Delegated design: Engage a qualified professional engineer, as defined in Section -01 40 00 "Quality Requirements" to design aluminum-framed entrances and storefronts.

D. Qualifications:
1. Manufacturer and Fabricator/Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years experience, and with service facilities within 300 miles of Project.
2. Design structural support framing components under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Washington.

E. Pre-installation meeting:
1. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
2. Convene minimum one week prior to commencing work of this section.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Special warranty: Installer to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship. Warranty period five years from date of Substantial Completion.

C. Finish warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory applied finishes. Warranty period 20 years from date of substantial completion.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install sealants nor glazing materials when ambient temperature is less than 40 degrees F during and 48 hours after installation.

PART 2 PRODUCTS

2.1 EXTERIOR ALUMINUM-FRAMED STOREFRONTS

A. Basis of design Manufacturers, Products:
   1. Kawneer Co., Inc.: Storefront system “Trifab VersaGlaze 451T”.
   2. Substitutions: Section 01 60 00 - Product Requirements.
      a. Oldcastle.
      b. EFCO Corporation.

B. Product Description:
   1. Storefront Aluminum Frame: Thermally broken; flush glazing stops; deflection head channel; drainage holes; internal weep drainage system, nominal size 1 3/4" x various widths as shown.
   2. Mullions: Profile of extruded aluminum with internal reinforcement of aluminum or shaped steel structural section.
   3. Swing Doors (Building Entries): Aluminum framed glass doors; 2" thick, nominal 4 1/2" wide top rail, 3” nominal vertical stiles, and nominal 12" wide bottom rail; square glazing stops; heavy wall (3/16" thick) stile and rail extrusions with 5/16" thick walls wherever hinging hardware is applied: heavy wall (3/16" thick) door frame extrusions; corners of stiles/rails internally reinforced with steel clips and high-strength fasteners.

2.2 INTERIOR ALUMINUM-FRAMED STOREFRONTS

A. Basis of design Manufacturers, Products:
   1. Kawneer Co., Inc.: Storefront system “InFrame” Interior Framing System.
   2. Substitutions: Section 01 60 00 - Product Requirements.
      a. Oldcastle.
      b. EFCO Corporation.

B. Product Description:
   1. Storefront Aluminum Frame: center glazing stops; deflection head channel; nominal size 2" x various widths as shown.

2. Mullions: Profile of extruded aluminum with internal reinforcement of aluminum or shaped steel structural section.

2.3 COMPONENTS

A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper typical, 6061 alloy, T6 temper for extruded structural members.

B. Steel Sections: ASTM A36; shaped to suit mullion sections, galvanized.

C. Glazing Materials: As specified in Section 08 80 00.
1. Exterior glazing noted as “BRI” to be Ballistic Resistant Insulated glass.
2. Interior glazing noted as “BR” to be Ballistic Resistant glass.
3. Interior and Exterior glazing noted as “TG” to be Tinted Glazing.
4. All glazing to be tempered safety glass.

D. Infill Panels: Manufacturer’s standard insulated panel construction with aluminum out and infer faces and special insulating core, 1” thick.

E. High performance sill: Manufacturer’s standard high performance sill and frame fillers.

F. Door Hardware: Furnish per section 08 71 00.

G. Window Hardware: Furnish manufacturer’s standard window hardware for types of windows and applications indicated.

H. Sealant and Backing Materials:
1. Sealant Used Within System (Not Used for Glazing): Manufacturer’s standard materials to achieve weather, moisture, and air infiltration requirements.
a. Dow 795 silicone sealant per manufacturer’s requirements.
2. Perimeter Sealant: Specified in Section 07 90 00.

I. Fasteners: Manufacturer's standard steel.

J. Louvers: Ruskin Elf 375 Louvers per Section 23 37 00 2.7. Size as indicated on drawings.

2.4 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement for door hardware.

F. Reinforce framing members for imposed loads.

2.5 SHOP FINISHING

A. Aluminum Surfaces: Kawneer standard color Medium Bronze #28.

B. Concealed Steel Items: manufacturer's standard.

C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.

D. Extent of Finish:
   1. Apply factory coating to surfaces exposed at completed assemblies.
   2. Apply finish to surfaces cut during fabrication so no natural aluminum is visible in completed assemblies, including joint edges.
   3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.
   4. Infill panel finish to match that of adjacent aluminum assembly.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify dimensions, tolerances, and method of attachment with other Work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions

B. Do not install damaged components.

C. Install wall system in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

D. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

E. Provide alignment attachments and shims to permanently fasten system to building structure.

F. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent Work.

G. Provide thermal isolation where components penetrate or disrupt building insulation.

H. Install sill flashings. Turn up ends and edges; seal to adjacent Work to form watertight dam.

I. Coordinate attachment and seal of perimeter air and vapor retarder materials.

J. Install integral flashings and integral joint sealers.

K. Set thresholds in bed of mastic and secure.

L. Install hardware using templates provided.

M. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.

N. Coordinate installation of perimeter sealants with Section 07 90 00.

O. All work of this Section must be installed in conformance with the manufacturer’s written instructions for field assembly.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

C. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.

B. Adjust operating hardware and sash (vents) for smooth operation.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect finished Work from damage.

3.7 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 53 00

VINYL WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Factory fabricated tubular extruded plastic (PVC) windows with fixed and operating sash, factory glazed, with operating hardware and insect screens.
2. Schedule of windows: refer to the drawings.
3. Requirements for installation and testing of PVC windows.

B. Performance Requirements:
1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
2. System Design: Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of window.
3. Configuration: Conform to AAMA 101 Designations for fixed and operating sash designs shown on the drawings.
4. Primary Performance Requirements: windows to meet or exceed performance criteria for ANSI / AAME / NWWDA 101/I.S.2. designation C20 Commercial windows.
5. Uniform Structural Load: Uniform Structural Load Test at 150% of Design Pressure. Test shall be conducted in accordance with ASTM E 330.
6. Assembly: To accommodate without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.
7. Vapor Seal: No vapor seal failure at lineal static pressure of 1 inch, 72 degrees F, and 40% of relative humidity.
8. Water Penetration: None, when measured in accordance with AAMA 502-08 using a uniform static air pressure difference of (Product rating dp x .15 x .667) psf. With a minimum field test pressure differential of 6psf.
9. System internal Drainage: Drain water entering assembly, condensation occurring in glazing channels, or migrating moisture within the system, to the exterior via a weep drainage network.
10. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout the assembly, primarily in line with inside pane of glass and glazing sealant.
11. Thermal Movement: Design sections to permit normal movement caused by thermal expansion and contraction of vinyl members to suit glass, infill, and perimeter opening construction.
12. Thermal Resistance of Assembly: U-Value of 0.25 or better when measured in accordance with NFRC 100. Solar Heat Gain Coefficient (SHGC) of 0.18 or better.
13. Acoustic Performance: Minimum STC rating of 36 for all windows facing Fruitvale Blvd.

14. Accessibility: In Type A accessible units at least one operable window shall be located so that the controls and latches are no more than 48" above finished floor.

C. Project Specific Requirements:
1. Windows facing Fruitvale Blvd. shall be acoustically rated.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry: Wood framed openings.
2. Section 07 26 00 - Vapor Barriers and Vapor Retarders.
3. Section 07 27 00 - Air Barriers and Water-Resistive Barriers.
4. Section 07 65 00 - Flexible Flashings.
5. Section 07 90 00 - Joint Protection.
6. Section 08 80 00 - Glazing.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 101 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
2. AAMA 303 - Voluntary Specification for Poly (Vinyl Chloride) (PVC) Exterior Profile Extrusions.
3. AAMA 501.2-03 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
4. AAMA 502-08 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
5. AAMA 503-03 – Voluntary Specification for Field Testing of Storefronts, Curtain Walls and Sloped Glazing Systems.
6. AAMA 511-08 – Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products.
7. AAMA 613 - Voluntary Performance Requirements for Test Procedures for Organic Coatings on Plastic Profiles.
8. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
9. AAMA/I.S.2/A440-08 – AAMA Gold Label Program: North American Certification Program for Mass Manufactured Products (Harmonized CSA and 101 ANS).

B. American Society of Civil Engineers: ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International:
1. ASTM C1036 - Specification for Flat Glass.
2. ASTM C1048 - Specification for Heat-Treated Flat Glass - Kind HS, Kind FT - Coated and Uncoated Glass.
3. ASTM D3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
4. ASTM D4726 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.

5. ASTM E1105-00 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtainwalls, by Uniform or Cyclic Static Air Pressure Difference.
6. ASTM E783-02 – Standard Test Method for Field Measurement of Air Leakage Through installed Exterior Windows and Doors.
7. ASTM E2112-07 - Standard practice for Installation of Exterior Windows, Doors and Skylights.
8. ASTM E2128-01a – Standard Guide for Evaluating Water Leakage of Building Walls.
9. ASTM E2099-00(2007) – Standard Practice for the Specification and Evaluation of Pre-Construction Laboratory Mockups of Exterior Wall Systems.
10. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
11. ASTM E330-02 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
12. ASTM E331-00 – Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
13. ASTM E547-00 – Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Cyclic Static Air Pressure Differential.
14. ASTM F588-07 – Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

D. Glass Association of North America: GANA - Glazing Manual.

E. National Fenestration Rating Council Incorporated: NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Schedule to indicate:
1. Manufacturer
2. Model number
3. Type
4. Design Pressure Rating
5. U-factor
6. SHGF value
7. CRF Value
8. Size
9. Frame Color
10. Glazing type
11. Vent / no vent
12. CPD Number

C. Shop Drawings: Submit window schedule indicating each unit size, rough-opening dimensions, framed opening tolerances, affected related work, and installation requirements.

D. Product Data: Submit component dimensions, anchorage and fasteners, glass, internal drainage, and typical details.

E. Samples: Submit sample window showing finish, glazing, hardware, screens, weather stripping, and frame and mullion sections.

F. Manufacturer's Certificates: Certify Product performance ratings by NFRC as meeting or exceeding specified requirements.

G. Energy compliance labels: refer to paragraph 3.5 below.

H. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. Fabricate window assemblies in accordance with AAMA 101 for types of windows required.
2. Insulated Glass: Fabricate insulated glass units in accordance with GANA (formerly FGMA) Glazing Manual.

A. Mock up: General Contractor will make provisions for a mock up and pre-installation conference for all products and trades included in the assembly of the exterior wall system per Section 01 40 00.
1. Subcontractor responsible for the work of this section required to attend.
2. Subcontractor responsible for the work of this section required to supply two typical residential windows, one operable and one fixed, for the mock up. These windows will not be re-used.

B. Window testing: refer to the Part 3 Execution portion of this Section.

C. Qualifications:
1. Manufacturer: Company specializing in manufacturing commercial windows with minimum three years experience, and with service facilities within 100 miles of Project.
2. Installer: Company specializing in installation of commercial windows with minimum three years experience, and approved by manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish ten-year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Furnish five-year manufacturer warranty for degradation of plastic color finish.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver to site in manufacturer's original unopened containers and packaging, with labels clearly identifying manufacturer and product name.

C. Protect flanges and finished surfaces with wrapping and/or boxing. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

D. Jig, brace, and box window frame assemblies for transport to minimize flexing of members and to minimize flexing of joints. Store off ground in a vertical position.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install glazing materials when ambient temperature is above or below manufacturer's stated limits. Maintain this temperature range during and after installation of sealants.

PART 2 PRODUCTS

2.1 VINYL WINDOWS

A. Manufacturer:
1. VPI Windows, Spokane, WA.
2. Substitutions: Section 01 60 00 – Product Requirements

B. Product Description: VPI Endurance Series Commercial Mid-Rise Windows, hollow tubular ultra-violet resistant polyvinyl chloride (PVC) window frames with welded corner construction. Configurations of fixed and operable sash as scheduled on the drawings.

C. All units to be NFRC rated.

D. Design Pressure 30 PSF per S100.

2.2 COMPONENTS

A. Frame: Extruded multi-chambered PVC frame with integral ultra-violet degradation resistance, continuous integral nailing fin; nominal depth 3 inches; nominal wall thickness 0.050 to 0.080 inches; corners mitered and heat welded. Continuous integral nailing flange.

B. Energy conservation requirements:
1. U-value 0.25 or better for entire unit.
2. SHGC 0.24 or better for entire unit.
3. See window schedule on sheet A610 for specific values.

C. Sound Attenuation: Minimum STC rating of 36 for all windows facing Fruitvale Blvd.

D. Insulating Glass: Sealed double pane units, 1 inch thick, argon filled, conforming to the following.
1. Manufacturer: Cardinal LoE 366 Glass.
2. Outer Pane: Clear, Low-E coating, float glass, ASTM C1036, Quality 1.
3. Inner Pane: Clear float glass, ASTM C1036, Quality 1.
4. Tempered where noted as “T” on drawings: Clear, ASTM C 1048.
5. Laminated interlayer where noted as “LAM” on schedule.
6. Thickness:
a. Pane thickness ¼”.
b. Spacer thickness ½”

c. Total unit thickness 1”

E. Limiters: limit window opening to 12” for all openings.

F. Sills: Tubular; sloped for positive wash; one-piece full width of opening.

G. Operable Sash Weather Stripping: Manufacturer's standard; permanently resilient, profiled to effect weather seal.

H. Insect Screen Frame: manufacturer's standard frame of rectangular sections; nominal size similar to operable glazed unit.

I. Integral magnetic contact switch installed by manufacturer.

J. Insect Screens: gray color.

K. Fresh Air Vent ports: not included.

L. Color: White PVC frame and hardware.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard.

2.4 FABRICATION

A. Integral nail flange.

B. Units to be factory assembled and glazed.

2.5 FINISHES

A. Manufacturer’s standard color, color selected by Architect from standard choices.

B. Screens: Frame color to match exterior frame color, with light-colored screening.

C. Pull Handles, Locks, and Exposed Hardware: Baked enamel color as selected by Architect from standard color choices.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section. Refer to step-by-step procedure for wrapping rough openings shown on the drawings.

C. Verify that window units are sized as required to provide an open perimeter shim space of not less than ¼" nor more than ½" in any location, or as otherwise required by the manufacturer.

D. Prior to installation, examine each window unit to assure that it is not damaged in any way. Do not install units that are damaged.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions. Refer to the drawings for application sequence for products of this Section.

B. Prior to installing window, install waterproofing in window head, sill and jamb per architectural drawings. See window installation sequence.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Insert and center window in opening, adjust as needed to assure unit is completely plumb, level and straight and free of warp or twist. Maintain dimensional tolerances and alignment with adjacent Work.

E. Operate ventilation sash to assure it operates properly. Adjust hardware for smooth operation and secure weathertight closure.

3.3 WINDOW WATER PENETRATION RESISTANCE TESTING

A. Testing procedure for installed (in-place) window testing. The firm or individual performing the test is retained by the Owner.

B. The fees of the testing agency for the initial installed window testing are paid by the Owner. Testing agency fees for subsequent testing in the event window(s) fail to pass will be paid for by the Contractor. Costs related to the coordination of the tests, together with required power, water supply, and miscellaneous clean up following the tests are paid by the Contractor.

C. Following complete installation of test windows and associated flashings, arrange with the testing firm to construct interior vacuum chamber and spray test per AAMA 502-90, Procedure B. Test units according to the Performance Requirements noted above in this Section.

D. Whether installed in a mockup wall or the permanent building wall, test one unit of each type of window scheduled on the drawings. Test to include the installed windows together with the specified sheathing, water resistive barrier, metal head flashing, and self-adhering membrane flashings in place. Units that include fresh air vent ports shall have the exterior hood installed.

E. If initial test passes, proceed with the installation of windows and perform the same test on other windows at the Architect's direction. Architect will select a second set of windows to include one of each type scheduled on the drawings.

F. If initial test fails, modify the failed unit(s) to remedy the failure and retest at contractor’s expense. If the modified unit(s) pass the subsequent retest, modify all remaining unit(s) of that type prior to being supplied and/or installed on this project.

3.4 ERECTION TOLERANCES

A. ADJUSTING Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non- cumulative or 1/8 inches per 10 ft, whichever is less.

3.5 REMOVING ENERGY-PERFORMANCE LABELS

A. Remove energy-performance labels from window glass only after the Building Inspector has reviewed and approved the installation.

B. Carefully remove labels, and provide the General Contractor with three undamaged labels from each separate window type (fixed, single-hung, casement, etc.) for the Project Manual to be provided to the Owner.

3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Remove protective material from pre-finished surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.7 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.

B. Related Sections:

1. Section 081100 Hollow Metal Doors and Frames
2. Section 081400 Wood Doors
3. Section 084113 Aluminum Entrances and Storefronts

1.2 QUALITY ASSURANCE

A. Product Qualification:

1. To assure a uniform high quality of materials for the project, it is intended that only specified items be furnished. Comparable products may be accepted upon prior approval of architect.
2. Hardware to be new, free of defects, blemishes and excessive play. Obtain each kind of hardware (Mechanical latch and locksets, exit devices, hinges and closers) from one manufacturer except where specified.
3. Fire-Rated opening in compliance with NFPA80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved bearing hinges and smoke seal. Furnish openings complete.

B. Supplier Qualifications:

1. Hardware supplier will be a direct factory contract supplier who employs a certified Architectural Hardware Consultant (AHC) available at all reasonable times during the course of the work for project hardware consultation to owner, architect and contractor.
2. Supplier will be responsible for detailing, scheduling and ordering of finish hardware.
3. Conduct pre-installation conference at jobsite. Initiate and conduct with supplier, installer and related trades. Coordinate materials and techniques and sequence complex hardware items and systems installation.

4. Key Conference shall be initiated and conducted with owner to determine system, keyway(s) and structure.

C. Installer Qualifications:

1. Installer to have not less than 3 years' experience specializing in installation of work in this section. Company must maintain qualified personnel trained and experienced in installing hardware.

1.3 REFERENCES

A. NFPA80 – Fire Doors and Windows

B. NFPA101 – Life Safety Code

C. NFPA105 – Smoke and Draft Control Door Assemblies

D. ANSI A117.1 Accessible and Usable Buildings and Facilities

1.4 SUBMITTALS

A. Hardware schedule: Submit digital copies of schedule. Organize vertically formatted schedule into Hardware Sets with index of doors and headings, indication complete designations of every item required for each door or opening. Include the following:

1. Type, style, function, size, quantity and finish of hardware items.
2. Name, part number and manufacture of each item.
3. Fastenings and other pertinent information.
4. Explanation of abbreviations, symbols and codes contained in schedule.
5. Door and frame sizes, materials and degrees of swing.

B. Product Data: Submit digital copies for each product indicated.

C. Templates: Obtain and distribute templates for doors, frames, and other works specified to be prepared for installing door hardware.

D. Wiring/Riser diagrams: As required for electric hardware indicated. ELECTRICAL COORDINATION MEETING: After receipt of approved finish hardware schedule, the hardware supplier shall organize and lead a meeting with all related suppliers and installers of electrified hardware and access control systems. Include copies of all door elevation drawings showing location of electrified hardware, point to point wiring diagrams, a separate hardware schedule only listing openings having electrified hardware as part of this section, and manufacturers' catalog cuts of electrified hardware including electrical specifications of the product, will be provided, by the hardware supplier, for each attendee at the meeting. The purpose of this meeting will be to insure that all parties understand their scope of work and the system operation and location of all electrified hardware products. Hardware supplier shall provide a system description for each hardware group that has electrified hardware.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

F. Keying Schedule: Prepared by or under the supervision of supplier, after receipt of the approved finish hardware schedule, detailing Owner’s final keying instructions for locks.

G. Samples: Upon request submit material samples.

H. THE SPECIFICATION WRITER MUST APPROVE ALL SUBMITTALS BEFORE ORDERS CAN BE PLACED.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect products to project site under provisions of Division 1 and as specified herein.

B. Tag each item or package separately, with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to Owner by registered mail.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers: Thirty years mechanical, two years electrical
b. Exit Devices: Three years mechanical, one year electrical
c. Locksets: Ten years(ND), three years (everything else), one year electrical

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.

B. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation.

2.2 MANUFACTURERS

A. Approval of products from manufacturers indicated as “Acceptable Manufacturer” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

ITEM	SCHEDULED MANUFACTURER	ACCEPTABLE MANUFACTURER
Hinges	Ives (IVE)	Hager, Bommer
Flush Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets & Deadlocks	Schlage (SCH)	NO SUB
Aluminum Door Locks - Narrow Style	Adams Rite (ADA)	None
Exit Devices & Mullions	Von Duprin (VON)	, Sargent,
Electric Strikes	Von Duprin (VON)	Trine, SDC
Power Supplies	Von Duprin (VON)	Precision, Sargent, Falcon
Cylinders & Keying	BEST CORMAX	Best NO SUB.
Door Closers	LCN (LCN)	Norton, Sargent, ,
Automatic Operators	LCN (LCN)	Norton, Besam
Door Trim	Ives (IVE)	Trimco, Burns
Protection Plates	Ives (IVE)	Trimco, Burns
Overhead Stops	Glynn-Johnson (GLY)	Rixson, Sargent
Thresholds & Weatherstrip	Zero (ZER)	NGP, Reese, Pemko

2.3 HANGING

A. Conventional Hinges: Hinge open width minimum, but of sufficient throw to permit maximum door swing. Steel or stainless steel pins:

1. Three hinges per leaf to 7 feet, 6-inch height. Add one for each additional 30 inches in height or any fraction thereof.
1. Provide 4 ½ x 4 ½ for 1 ¾” thick doors up to 3’5”. Provide 5 x 4 ½ on doors 36” and over.
2. Exterior outswing doors to have non removable (NRP) pins.
3. Pin tips, flat button, finish to match leaves
4. Interior doors over 36” – Heavy weight
5. Interior doors up to 36” – Standard weight

2.4 LOCKSETS, LATCHSETS, DEADBOLTS

A. Heavy Duty Mortise Locks and Latches: Schlage L9000 Series

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security.
2. Provide lock case that is multi-function and field reversible for handing without opening case, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Provide electrified options as scheduled in the hardware sets.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 06A

B. Cylindrical Locks and Latches: Schlage AL Series

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 2.
2. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch (13 mm) latch throw. Provide 2-3/8 inches (60 mm) backset where noted of if door or frame detail requires. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with separate anti-rotation throughbolts, and no exposed screws. Provide levers that operate independently, and have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

    a. Lever Design: Schlage Sat

2.5 EXIT DEVICES

A. Panic and Fire Rated Exit Devices: Von Duprin 98/99 Series

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Provide compression springs in devices, latches, and outside trims or controls; tension springs also acceptable.

4. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide exit devices with manufacturer's approved strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
7. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
8. Provide cylinder [hex-key] dogging at non-fire-rated exit devices, unless specified less dogging.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Provide UL labeled fire exit hardware for fire rated openings.
11. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
12. Provide electrified options as scheduled.
13. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.

B. Panic and Fire Rated Exit Devices: Von Duprin 98/99 Series

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, AND UL listed for Panic Exit or Fire Exit Hardware.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.

    a. Cable: Stainless steel core wire in stainless steel with polytetrafluoroethylene (Teflon®) liner color-coded to latches and center slides. Conduit and core wire ends snap into latch and center slides without use of tools.
    b. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
    c. Top Latchbolt: Minimum 0.382 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
    d. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
    e. Product Cycle Life: 1,000,000 cycles.

f. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
g. Latch release does not require separate trigger mechanism.
h. Cable and latching system characteristics:
   1) Assembled prior to being installed in door.
   2) Installed in door as complete assembly.
   3) Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
   4) Connected to exit device at single attachment point.
   5) Bottom latch height adjusted from single point, after system is installed and connected to exit device, while door is hanging
   6) Latch position altered up and down 2 inches (51 mm) without additional adjustment.
   7) System may be removed while door is hanging.
   8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
   9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.

6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
8. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.

2.6 ELECTRIC STRIKES

A. Manufacturers and Products: Von Duprin 6000 Series

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.

5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.7 KEYS, KEYING, AND KEY CONTROL

A. See Keying Requirements in this section

2.8 CLOSERS

A. Surface Closers: LCN 4040XP Series

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
4. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
5. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
6. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
9. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

Electro-Hydraulic Automatic Operator: LCN 4600 Series

10. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
11. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
12. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
13. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.

14. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
15. Provide drop plates, brackets, or adapters for arms as required for details.
16. Provide hard-wired actuator switches for operation as specified.
17. Provide weather-resistant actuators at exterior applications.
18. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
19. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
20. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.9 OTHER HARDWARE

A. Door stops: Provide stops to protect walls, casework or other hardware.

1. Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
2. Where wall or floor stops are not appropriate, provide overhead holders.

B. Weatherstrip and Gasket

1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled.
2. Provide non-corrosive fasteners as recommended by the manufacturer for application indicated.

C. Thresholds

1. Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as detailed or scheduled.

D. Silencers

1. Interior hollow metal frames, 3 for single doors, 2 for pairs of doors.

E. Kickplates

1. Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

2.10 HARDWARE FINISH

A. Provide the following finishes unless noted differently in hardware groups:

Hinges	630 Stainless Steel Exterior, 652 Dull Chrome Interior
Locksets	626 Dull Chrome
Exit Devices	626 Dull Chrome
Closers	689 Aluminum
Kickplates	630 Stainless Steel
Other Hardware	626 Dull Chrome
Thresholds	Aluminum
Weatherstrip/Sweeps	Aluminum

2.11 KEYING REQUIREMENTS

A. All keyed cylinders shall be subject to a Existing Best CORMAX Masterkey system. Verify Owners requirements.

B. HARDWARE SUPPLIER SHALL CONFIRM BEST CORMAX CORE TYPE WITH OWNER AND VERIFY WILL WORK WITH THE SPECIFIED LOCKS – VERIFY WITH OWNER BEFORE ORDERING

C. Furnish cylinders with construction cores. Following construction supply permanent keyed cores.

D. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.

E. Key Quantities
   - 6 EA Master Keys
   - 4 EA Control Keys
   - 2 EA Construction Control Keys
   - 10 EA Construction Keys
   - 3 EA Change Keys per keyed alike group

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes. Notify Architect of any code conflicts before ordering materials.

3.2 INSTALLATION

A. Do not install surface mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.

B. Locate floor stops not more than 4 inches from the wall.

C. Drill pilot holes for fasteners in wood doors and/or frames.

3.3 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

B. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner’s satisfaction.

3.4 FOLLOW UP INSPECTION

A. Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit project with representative of the manufacturers of the locking devices and door closers to accomplish the following:

1. Re-adjust locks and closers
2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner’s personnel.
3. Identify items that have deteriorated or failed.
4. Submit written report identifying problems and likely future problems.

3.5 DEMONSTRATION

A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures

3.6 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

DOOR HARDWARE GROUPS

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	FACULTY RESTROOM	L9485T 06A L583-363		626	SCH
1	EA	SURFACE CLOSER	1261 SLIM		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV ...OR 060 IF W.S. WONT WORK		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	545A-223		A	ZER
2	EA	DOOR VIEWER	U698 2 EA FOR H, C UNITS		626	IVE

Hardware Group No. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722		626	SCH
1	EA	SURFACE CLOSER	1461		689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX		630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	98-NL-SNB		626	VON
1	EA	RIM CYLINDER	1E72		626	BES
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	SURFACE CLOSER	1461		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 06

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
2	EA	MANUAL FLUSH BOLT	FB358		626	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	SURFACE CLOSER	1461 EDA STD ACTIVE LEAF		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX		630	IVE
2	EA	WALL STOP	WS406/407CCV		626	IVE
4	EA	SILENCER	SR64/SR65		GRY	IVE

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	ELECTRONIC LOCK	EK-2190 LEVER AS REQ. CYL AS REQ.		626	ADA
1	EA	CONT. HINGE	112HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA		689	LCN
1	EA	BLADE STOP SPACER	4040-61		689	LCN
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

Hardware Group No. 08

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
2	EA	MANUAL FLUSH BOLT	FB358		626	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	1461 EDA STD ACTIVE LEAF		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX		630	IVE
4	EA	SILENCER	SR64/SR65		GRY	IVE

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE 12/16/24/28 VAC/VDC		630	VON
1	EA	SURFACE CLOSER	1461		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1			CARD READER - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

Hardware Group No. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	OFFICE/ENTRY LOCK	L9050T 06A 09-544	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	SURFACE CLOSER	1461 ..OR PA VERIFY		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-35A-NL-OP-388 24 VDC	✓	626	VON
2	EA	RIM CYLINDER	1E72		626	BES
2	EA	90 DEG OFFSET PULL	8190HD 12" O		630	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURF. AUTO OPERATOR	9542 MS AS REQ (120/240 VAC)	✓	ANCLR	LCN
2	EA	ACTUATOR, JAMB MOUNT	8310-818T	✓	630	LCN
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA	POWER SUPPLY	PS902 900-2RS-FA 120/240 VAC	✓	LGR	SCE
1			CARD READER - WORK OF DIVISION 28			
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

Hardware Group No. 13

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	OFFICE/ENTRY LOCK	L9050T 06A 09-544		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 14

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112HD		628	IVE
1	EA	PANIC HARDWARE	35A-NL-OP-388		626	VON
1	EA	RIM CYLINDER	1E72		626	BES
1	EA	ELECTRIC STRIKE	6111 FSE 12/24 VAC/VDC		630	VON
1	EA	90 DEG OFFSET PULL	8190HD 12" O		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA		689	LCN
1	EA	BLADE STOP SPACER	4040-61		689	LCN
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

Hardware Group No. 15

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112HD		628	IVE
1	EA	PUSH/PULL BAR	9190HD-12"-NO		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA		689	LCN
1	EA	BLADE STOP SPACER	4040-61		689	LCN
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	DOOR SWEEP	39A		A	ZER
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

Hardware Group No. 16

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112HD		628	IVE
2	EA	MORTISE CYLINDER	1E74		626	BES
2	EA	PANIC HARDWARE	3547A-NL-OP-388		626	VON
2	EA	RIM CYLINDER	1E72		626	BES
2	EA	RIM CYLINDER	20-057		626	SCH
2	EA	90 DEG OFFSET PULL	8190HD 12" O		630	IVE
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4040XP EDA		689	LCN
2	EA	PA MOUNTING PLATE	4040-18PA		689	LCN
2	EA	BLADE STOP SPACER	4040-61		689	LCN
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

Hardware Group No. 17

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080P6 06A HALF TRIM NO OUSTSIDE LEVER		626	SCH
1	EA	SURFACE CLOSER	1461 EDA STD		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 18

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-OP-110MD 24 VDC	✓	626	VON
1	EA	RIM CYLINDER	1E72		626	BES
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	90 DEG OFFSET PULL	8190HD 12" O		630	IVE
1	EA	SURF. AUTO OPERATOR	9542 MS AS REQ (120/240 VAC)	✓	ANCLR	LCN
1	EA	WALL MOUNT PUSHPLATE	8310-852T	✓	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA	POWER SUPPLY	PS902 900-2RS-FA 120/240 VAC	✓	LGR	SCE
1			CARD READER - WORK OF DIVISION 28			

Hardware Group No. 19

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	PASSAGE SET	L9010 06A			626	SCH
1	EA	SURFACE CLOSER	1461 EDA STD ..OR PULL VERIFY			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX			630	IVE
1	EA	MAGNET	SEM7850 12V/24V/120V		✓	689	LCN
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	DOOR SWEEP	39A			A	ZER
1	EA	THRESHOLD	545A-223			A	ZER

Hardware Group No. 20

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	HARDWARE BY DOOR SUPPLIER		

Hardware Group No. 21

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	POWER TRANSFER	EPT10		✓	689	VON
1	EA	EL MORTISE LOCK	L9092TEL 06A CON 12/24 VDC		✓	626	SCH
1	EA	SURFACE CLOSER	1461			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX			630	IVE
1	EA	WALL STOP	WS406/407CCV			626	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	DOOR SWEEP	39A			A	ZER
1	EA	THRESHOLD	545A-223			A	ZER
1			CARD READER - WORK OF DIVISION 28				
1			POWER SUPPLY - WORK OF DIVISION 28				

Hardware Group No. 22

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. 23

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	AL40S SAT		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64/SR65		GRY	IVE

Hardware Group No. 24

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	AL10S SAT		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64/SR65		GRY	IVE

Hardware Group No. 27

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

Hardware Group No. 28

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	MORTISE CYLINDER	1E74		626	BES
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE 12/16/24/28 VAC/VDC		630	VON
1	EA	SURF. AUTO OPERATOR	9542 MS AS REQ (120/240 VAC)		ANCLR	LCN
2	EA	ACTUATOR, JAMB MOUNT	8310-818T ...OR		630	LCN
2	EA	WALL MOUNT PUSHPLATE	8310-852T		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 29

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELEC PRIVACY LOCK	CO-200-CY-40-KP-LAT-B 4B BATTERY OPERATED		626	SCE
1	EA	SURFACE CLOSER	1461		689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX		630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

3.7

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Glass glazing for metal frames, doors, windows, mirrors. Glass and glazing materials and installation requirements are included in this section for other sections referencing this section.

B. Performance Requirements:
   1. Structural: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E1300.
   2. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with requirements in ASTM E1996 for Wind Zone 1 when tested according to ASTM E 1886.
      a. Large Missile Test for glazing located within 30 feet of grade.
      b. Small Missile Test for glazing located more than 30 feet above grade.
   3. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. Ballistic Resistant glass required on level 1 windows facing Fruitvale Blvd.
   2. Tinted Glass required on level 1 office and common room windows facing Fruitvale Blvd.

D. Related Sections:
   1. Section 07 90 00 - Joint Protection
   2. Section 08 11 15 - Hollow Metal Doors and Frames.
   3. Section 08 14 16 - Flush Wood Doors.
   4. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts.
   5. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.2 REFERENCES

A. American National Standards Institute: ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.

B. ASTM International:
   1. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
   2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   3. ASTM C1036 - Standard Specification for Flat Glass.
   4. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
   5. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
   6. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   7. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

8. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
9. ASTM E773 - Standard Test Methods for Seal Durability of Sealed Insulating Glass Units.
10. ASTM E774 - Standard Specification for Sealed Insulating Glass Units.
11. ASTM E1425 - Standard Practice for Determining the Acoustical Performance of Exterior Windows and Doors.

C. Glass Association of North America:
1. GANA - FGMA Sealant Manual.
2. GANA - Glazing Manual.
3. GANA - Laminated Glass Design Guide.

D. National Fire Protection Association:
1. NFPA 80 - Standard for Fire Doors, Fire Windows.
2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
3. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data:
   a. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
   b. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
2. Samples: Glass: Submit two samples 12" x 12" in size, illustrating each glass unit, coloration and design.
3. Manufacturer's Certificate: Certify sealed insulated glass meets or exceeds specified requirements.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and GANA Laminated Glass Design Guide for glazing installation methods.

B. Fire Rated Window Glazing: Tested in accordance with NFPA 257 and complying with NFPA 80. NFPA 257; adjusted so two-thirds of test specimen is above neutral pressure plane at 10 minutes into test.

C. Fire Rated Door Glazing: Tested in accordance with one of the following and complying with NFPA 80.
1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at 5 minutes into test.
2. UL 10C.

D. Apply label from agency approved by authority having jurisdiction to identify each fire rated glass lite.

E. Qualifications:
1. Installer: Company specializing in performing Work of this section with minimum three years experience and approved by manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion..

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install glazing when ambient temperature is less than 50 degrees F, or as otherwise recommended by the manufacturer.

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 GLAZING

A. Listed Manufacturer: Cardinal Glass Industries.

B. Other Manufacturers:
   1. PPG Industries.
   2. Guardian Industries.
   3. Libbey-Owens-Ford, Inc. (LOF).
   4. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Flat Glass (Type FG): 1/4 inch unless otherwise indicated.
   1. Clear Float Glass (Type FG-CF): ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
   2. Clear Heat Strengthened Glass (Type FG-CH): ASTM C1048, Kind HS, heat strengthened, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
   3. Tinted Float Glass (Type FG-TF): ASTM C1036, Type 1 transparent flat, Class 2 (tinted heat-absorbing and light reducing) or Class 3 (tinted light reducing), Quality q3 glazing select.
   4. Location: where noted as “FG” on schedule.

B. Safety Glass (Type SG): Conform to ANSI Z97.1, minimum thickness 1/4 inch unless otherwise indicated.
   1. Clear Tempered Glass (Type SG-CT): ASTM C1048, Kind FT Fully tempered, Condition A, uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
   2. Labeling: Permanently marked on at least one component of unit with certification label of SGCC.
   3. Location: Where noted as “TS” on schedule.

C. Insulated Glass Units (Type IG):
   1. Total unit thickness 1 inch; Double Pane Insulated Glass Units (Type IG-DP); ASTM E774 Class A and E773; Insulated Glass Unit Edge Seal Construction: Manufacturer's standard seal, dual sealed with butyl, all non-metallic.
   2. Listed Product: Cardinal Solar Control Low-E Glass:
      a. Transmittance: ultra-violet 8%, visible 64%, total solar energy 25%
      b. U-Value: winter nighttime 0.28, summer daytime 0.26
      c. Shading Coefficient: 0.42
      d. Solar Heat Gain Coefficient: 0.26
   3. Labeling: Permanently marked on spacers or on at least one component of unit with certification label of IGCC.
   4. Location: Where noted as “IG” on schedule.

D. Glass for vinyl nail flange windows: Supplied and installed per Section 08 53 00.

E. Bullet Resistant Insulated Glass:
   1. Total Thickness 1-1/4 inch; Double Pane Insulated Glass.
   2. Listed Product: Defender Ballistic Insulated Glass by Total Security Solutions.
      a. Product: TSS IG 001 L/S
      b. Ballistic and Forced Entry Rating UL 752: Level 1
      c. ANSI Z971 Pass
      d. ASTM C1036
   3. Glass: Tinted glass, gray.

4. Location: Where noted as “BRI” on schedule.

F. Bullet Resistant Glass:
1. Total Thickness 1-1/16 inch.
2. Listed Product: Ballistic Glass-Clad Polycarbonate by Total Security Solutions.
a. Ballistic and Forced Entry Rating UL 752: Level 2
3. Glass: Clear.
4. Location: Where noted as “BR” on schedule.

G. Fire Rated Glass:
1. 45, and 90-minute fire and safety rated wired glass.
2. Manufactures: WireLite NT as supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie WA.
3. Design Requirements:
a. Nominal thickness of 1/4”
b. 2.4 lbs. / sq. ft.
c. Filmed (7 mil) wired glass free of noticeable irregularities.
d. Fire Rating: 45 minutes or 90 minutes with hose stream as indicated on drawings.
e. UL Listed.
f. Impact Safety Resistance: ANSI Z97.1 and CPSC 16 CRF 1201 Cat. I & II
g. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80.
4. Labeling: Permanently label each piece of fire rated glass with the manufacturer’s label
5. Location: Where noted as “FRG” on schedule.

G. Mirror Safety Glass: ASTM C1503-01, ASTM C1048, heat treated silvered flat glass mirror.
1. Edges: Polished, square.
2. Thickness: ¼" unless otherwise indicated.
3. Size: indicated on drawings.

2.3 ACCESSORIES

A. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, laminated glass core, insulating glass seals, and glazing channels.
1. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; capable of water immersion without loss of properties; cured Shore A hardness of 15 to 25.
2. Polysulfide Glazing Sealant: ASTM C920, Type M, Grade NS, Class and Use suitable for glazing application indicated; two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25.
3. Polyurethane Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component,

chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35.

4. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25.

B. Setting Blocks: ASTM C864, Neoprene, EPDM or Silicone, Shore A durometer hardness, 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.

C. Spacer Shims: ASTM C864, Neoprene or Silicone, 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of glazing stop x thickness to suit application.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories (mechanical): Satin stainless steel clips, J-profile.

F. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify openings for glazing are correctly sized and within acceptable tolerance.

C. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

A. Perform installation in accordance with GANA Glazing Manual.
1. Glazing Sealants: Comply with ASTM C1193.
2. Fire Rated Openings: Comply with NFPA 80.

B. Mirror Installation:
1. Frameless Mechanical Installation: Set mirrors with J-profile channel clips. Anchor rigidly to wall construction. Place plumb and level.
2. Frameless Adhesive Installation: Set mirrors with adhesive. Place plumb and level without visible distortion.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean glass and adjacent surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 08 91 00

LOUVERS

GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fixed and operable louvers, frames and accessories as required for mechanical equipment.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 07 90 00 - Joint Protection.
   2. Section 09 90 00 - Painting and Coating.
   3. Division 23 - HVAC.
   4. Division 26 - Electrical.
   5. Mechanical Engineering drawings and schedules.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.: AMCA 500- L - Test Methods for Louvers, Dampers, and Shutters.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals
   1. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames. Indicate wiring diagrams for operating louvers.
   2. Product Data: Submit data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
   3. Samples: Submit five 3x3 inch in size illustrating finish and color of exterior and interior surfaces.
   4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AMCA Certification for Water Penetration, Air Performance, and Wind Driven Rain, in compliance with AMCA 500-L. Attach AMCA seal to louvers.
   1. Louvers through building envelop shall be designed in accordance with wind and rain exposure conditions. The minimum Wind and Water Resistance Pressure per manufacturer shall be 6.0 psf for louvers.

B. Conform to applicable code for closing operable louvers in conjunction with fire and smoke alarm system.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

D. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

E. Verify field measurements prior to fabrication.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish twenty-year manufacturer warranty for louvers. Include coverage for degradation of factory-applied finish.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with installation of mechanical ductwork and electrical services to motorized devices.

PART 2 PRODUCTS

2.1 WALL LOUVERS – MECHANCIAL LOUVERS

A. Manufacturers:
   1. Cesco Products.
   2. Ruskin Louvers
   3. Construction Specialties Inc.
   4. Greenheck Corp.
   5. Substitutions: Section 01 60 00 - Product Requirements.

B. Louver Construction: Aluminum or Steel.
   1. Louver Panel Thickness: Nominal 4 inches deep, face measurements as indicated on drawings and/or schedules.
   2. Louver Blade Design: Sloped at 45 degrees to drain to the exterior.

C. Schedule: See Mechanical Drawings.

D. Components
   1. Aluminum: ASTM B221 alloy, extruded shape; refinished with shop applied siliconzed polyester, fluoropolymer, or polyvinylidene fluoride finish.

2. Steel Sheet: ASTM A653, galvanized to G90 zinc coating, prefinished with shop applied siliconized polyester fluoropolymer, or polyvinylidene fluoride finish.
3. Bird Screen: Interwoven wire mesh of steel or aluminum, manufacturer's standard and compatible with louver material, 0.063-inch diameter wire, 1/2 inch open weave, square design.
4. Insect Screen: Aluminum or steel mesh, set in aluminum or steel frame, manufacturer's standard and compatible with louver material.

E. Accessories
1. Fasteners and Anchors: Galvanized or Stainless steel type, manufacturer's standard.
2. Sealants: type specified in Section 07 90 00.

F. Fabrication
1. Louver Blade Design: Slope and style as specified for each louver type; reinforced with intermediate stiffeners if required due to blade length, manufacturer's standard material thickness.
2. Louver Frame: Channel shape, welded corner joints. Form perimeter of frames with return leg on channel shape to retain backer rod for sealant application.
3. Intermediate Mullions: Exposed, of formed material and profile to suit louver frame.
4. Head and Sill Flashings: Shapes shown on drawings, single length in one piece for each location.
5. Screens: Install screen mesh in shaped frame, reinforce corner construction, shop install to louver with fasteners.
6. Blank-Out Sheeting on Interior of Louver: If indicated on Mechanical drawings or schedules; Same material as louver and frame.

G. Factory Finishing
1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker. Color: As selected by Architect from full range of industry colors and color densities
2. Exterior and interior steel surfaces: Shop coats of primer and top coats, color as selected by the Architect from the manufacturer's standard color choices.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify prepared openings and flashings are ready to receive Work and opening dimensions are as indicated on approved shop drawings.

C. For operating louvers, verify electric power is available and of correct characteristics.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Install louvers level and plumb.

C. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louvers in opening framing with concealed fasteners.

E. Install bird and insect screen and frame to interior of louver. Hinge screens for access.

F. Install perimeter sealant and backing rod in accordance with Section 07 90 00.

3.3 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements - Final cleaning.

B. Strip protective finish coverings. Clean surfaces and components.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Gypsum board and joint treatment; gypsum sheathing; cementitious backer board; acoustic insulation; and textured finish.

B. Performance Requirements:
1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
2. Install water resistant gypsum board at bathtubs in accordance with the requirements of ESDS Criterion 7.9c. Gypsum board to meet mold-resistant requirements of ASTM #D3273 with a score of at least 10.
3. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
4. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

C. Project Specific Requirements:
1. None.

D. Related Sections:
1. Section 03 54 00 – Cast Underlayment.
2. Section 06 10 00 - Rough Carpentry.
3. Section 07 21 16 - Blanket Insulation.
4. Section 08 31 13 - Access Doors and Frames.
5. Section 09 22 16 – Non-Structural Metal Framing.
6. Section 09 72 00 - Wall Coverings.
7. Section 10 28 00 - Toilet, Bath and Laundry Accessories.

1.2 REFERENCES

A. ASTM International:
1. ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
3. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
4. ASTM C1047 – Standard Specification for Accessories for Gypsum wallboard and Gypsum Veneer Base.
5. ASTM C1278/C1278M – Standard Specification for Fiber-Reinforced Gypsum Panel.
6. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.

7. ASTM C1396/C1396M – Standard Specification for Gypsum Board.
8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
9. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Gypsum Association:
1. GA 214 - Recommended Levels of Gypsum Board Finish.
2. GA 216 - Application and Finishing of Gypsum Panel Products.
3. GA 600 - Fire Resistance Design Manual Sound Control.

C. National Fire Protection Association:
1. NFPA 221 – Standard for High Challenge Fire Walls, Fire Walls and Fire Barrier Walls.
2. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
3. NFPA 286: Standard Methods of Fire Tests for Evaluating Contbution of Wall and Ceiling Interior Finish to Room Fire Growth.

D. Northwest Wall and Ceiling Bureau (NWCB): Wall and Ceiling Manual.

E. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Product Data: Submit data on gypsum board, joint materials, fasteners, surface texturing products.
2. Assembly Tests: Submit data on tested wall, floor/ceiling and roof assemblies. Data must show compliance with fire rating and acoustic requirements.
3. Submittal: Submit two samples of interior texture finish.
4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13-2.2.

C. ESDS Binder:
1. Product Data: Provide data showing gypsum backer board at showers meets mold-resistant requirements per ASTM #D3273 with a score of at least 10 per Section 01 81 13 – 1.6 C.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C1280, GA-214, GA-216.
1. Fire Rated Wall, Floor and Roof Construction: Rating as indicated on Drawings. Tested Rating: Determined in accordance with ASTM E84 and ASTM E119.
2. Fire Rated Partitions, ceilings, column framing, beam framing, and shaft wall assemblies: Listed assembly by UL number and/or GA File number shown in drawings.

B. Qualifications:

1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
2. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 WARRANTY

A. Standard one year warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Per ASTM C1264 – Standard Specification for Sampling, Inspection, Rejection, Certification, Packaging, marking, Shipping, Handling, and Storage of Gypsum Panel Products

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Listed Manufacturer: USG Corporation.

B. Other Manufacturers accepted:
1. Celotex/BPB.
2. G-P Gypsum Corp.
3. CertainTeed Corporation
4. American Gypsum Company LLC
5. National Gypsum Co.

2.2 GYPSUM BOARD ASSEMBLIES

A. Standard Gypsum Board:
1. ASTM C1396/C1396M; 1/2 and 5/8 inch thick; ends square cut, tapered edges.

B. Fire Rated Gypsum Board:
1. ASTM C1396/C1396M; fire resistive type, UL or WH rated; type “X” gypsum wallboard, 1/2 and 5/8 inch thick, maximum available length in place; ends square cut, tapered edges. USG Sheetrock Brand Firecode C Panels.
2. Locations:
a. At fire rated walls as indicated on drawings.

C. Moisture Resistant Interior Gypsum Board:
1. ASTM C1278/C1278M; 5/8 inch thick, maximum available length in place; ends square cut, tapered edges; USG Fiberock Brand Aqua-Tough Gypsum Interior Panels or approved equal.
a. Meets mold-resistant requirements per ASTM #D3273 with a score of at least 10 per ESDS 4.0.

2. Locations:
   a. Walls and ceiling in residential unit bathrooms.
   b. Walls and ceilings in common bathrooms.
   c. Walls in janitor's closet behind or adjacent to service sinks.

D. Gypsum Backing Board:
1. ASTM C1396/C1396M; fire and non-fire rated type as indicated on the drawings; 5/8 inch thick; tapered edges, ends square cut, maximum available size in place.
2. Locations:
   a. Not used in this project.

E. Exterior Gypsum Sheathing Board:
1. ASTM C79; moisture resistant type, fire resistant type as indicated on the drawings; 5/8 inch thick, maximum available size in place; ends square cut, square edges; water repellent faces. USG Fiberock Brand Aqua-Tough Sheathing Panels, Georgia Pacific DensGlass or approved equal.
2. Locations:
   a. Exterior locations below siding as indicated in drawings.

F. Exterior Gypsum Sheathing Board:
1. ASTM C79; moisture resistant type, fire resistant type as indicated on the drawings; 5/8 inch thick, maximum available size in place; ends square cut, square edges; water repellent faces.; face pre-primed for adhesives.
2. Locations:
   a. Exterior locations where attachment to adhesive applied roofing is required – on the interior face of parapets, elevator overruns, stair overruns, equipment curbs.
   b. As cover board at roof.
3. Georgia Pacific DensDeck prime or approved equal.

G. Gypsum Shaft Liner Board:
1. ASTM C1396/C1396M, 1-inch thick, maximum available size in place; square edges, ends square cut. Proprietary shaft wall assembly requires the following manufacturers:
   a. United States Gypsum Company, 1" Sheetrock Brand Gypsum Liner Panels.
2. Locations:
   a. Ventilation shafts where indicated on drawings.
   b. Elevator shaft where indicated on drawings.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C665; Refer to Section 07 21 16.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

C. Trim Accessories: Provide manufacturer's standard hot-dipped galvanized ASTM C 1047 steel beaded units with nailing flanges for concealment in joint compound.
1. Corner beads: Metal, or metal and paper combination.
2. L-type and J-type trim beads, for flush joint compound use.

3. Special shapes shown on the drawings and as needed to complete installation.

D. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

E. Resilient furring channels: ASTM C645 resilient channel, Dietrich Metal Framing RC Deluxe, 20 ga., single-leg; install at locations noted on drawings. No substitutions.

F. Textured Finish Materials: ASTM C840 latex based texturing material, manufactured by National Gypsum Co., Gold Bond Building Products, U.S. Gypsum Company.

G. Paint Primer: refer to Section 09 90 00.

H. Fasteners: ASTM C1002, Type S12 for steel framing, W for wood framing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

C. Verify wood framing moisture content is 19% or lower.

3.2 INSTALLATION

A. Acoustic Accessories Installation:
1. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
2. Install acoustic sealant at gypsum board perimeter at:
   a. Metal Framing: Two beads.
   b. Unit Partitions and Corridors: Two beads.
   c. Seal penetrations of partitions by conduit, pipe, duct work, rough-in boxes, and the like.

B. Gypsum Board Installation:
1. Install gypsum board in accordance with GA-216 and GA-600.
2. Erect single layer board horizontal, with ends and edges occurring over firm bearing.
3. Erect single or double layer fire rated gypsum board as directed in the standards, with edges and ends occurring over firm bearing.
4. Erect exterior gypsum sheathing in accordance with ASTM C1280, horizontally, with edges butted and ends occurring over firm bearing.
5. Use screws when fastening gypsum board to metal furring or framing.
6. Use nails or screws when fastening gypsum board to wood furring or framing. Staples may not be used.
7. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions and ceilings. Secure

second layer to first with fasteners. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.

8. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
9. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.
10. Place control joints consistent with lines of building spaces or as otherwise directed.
11. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials, or as indicated on Drawings.
12. Install cementitious backing board over studs, plywood sheet, or gypsum board as indicated on the drawings.
13. Apply gypsum board to curved walls in accordance with GA-216.

C. Joint Treatment:
1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
2. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
3. Fill and finish joints and corners of cementitious backing board.

D. Texture Finish:
1. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   a. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   b. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. Spray applied finish texture coating to achieve full coverage orange peel (light spatter) finish. Apply to all walls and ceilings except those walls scheduled for wall covering.
2. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Metal stud framing and accessories at interior locations as shown on drawings.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
2. A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
3. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Project Specific Requirements: Steel studs installed in ventilation shafts and elevator shafts as shown on drawings.

D. Related Sections:
1. Section 06 10 00 - Rough Carpentry
2. Section 07 21 16 - Blanket Insulation
3. Section 07 26 16 - Under-Slab Vapor Barriers.
4. Section 07 27 00 - Air and Water Barriers.
5. Section 09 21 16 - Gypsum Board Assemblies

1.2 REFERENCES

A. American Iron and Steel Institute:
1. AISI S200 – North American Standard for Cold-Formed Steel Framing – General Provisions.
2. AISI S211 - North American Standard for Cold-Formed Steel Framing – wall Stud Design
3. AISI S212 – North American Standard for Cold-Formed Steel Framing – Header Design.
4. AISI S220 - North American Standard for Cold-Formed Steel Framing – Non-Structural Members.

B. ASTM International:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A591/A591M - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.

3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
5. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
6. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs of Steel Studs.
7. ASTM A1003/A1003M – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
8. ASTM C635/C635M – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings:
      a. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, type and location of fasteners, and accessories or items required of other related work.
      b. Describe method for securing studs to tracks and for blocking and reinforcement to framing connections.
   2. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AISI S200 and AISI S220.

B. Form, fabricate, install, and connect components in accordance with AISI S220.

C. Furnish framing materials in accordance with AISI S220.

D. Qualifications:
   1. Manufacturer:
      a. Company specializing in manufacturing products specified in this section with minimum three years documented experience.
      b. Framing Manufacturer: Current member of Steel Stud Manufacturers Association.
   2. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.5 WARRANTY

A. Provide standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Per Section 01 60 00 – Product Requirements.

B. Notify manufacturer of damaged materials received prior to installation.

C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Per section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 METAL FRAMING SYSTEM

A. Manufacturers:
1. ClarkDietrich Building Systems.
2. CEMCO; California Expanded Metal Products Co.; Deflex Clips.
3. Steel Network, Inc. (The)

2.2 COMPONENTS

A. Deflection Track:
1. Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

B. Shaft Wall Studs and Accessories:
1. ASTM C 645
2. Non-load bearing rolled steel, channel shaped, punched for utility access, 20 gage or as scheduled.
3. As required by shaft wall assembly.
a. USG C-H Studs 25 ga.

C. Resilient Furring Channels:
1. Sound Attenuation Furring Channels: As specified in Section 09 21 16.

D. Fasteners: ASTM C1002, self-drilling, self-tapping screws.

E. Sheet Metal Backing: Where shown in drawings, or required for installation of materials or systems provided in other sections. 0.03 galvanized steel.

F. Acoustic Sealant: As specified in Section 09 21 16.

2.3 SHOP FINISHING

A. Studs: Galvanize to G60 coating class.

B. Tracks and Headers: Galvanize to G60.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough-in utilities are in proper location.

3.2 INSTALLATION

A. Align and secure top and bottom runners at 12 inches oc.

B. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction to achieve acoustic seal at interior locations.

C. Achieve air-tight seal between runners and substrate with sealant in conjunction with Section 07 27 00 at exterior wall locations.

D. Metal Stud Installation:
1. Install studs according to manufacturer’s written instructions.
2. Install studs in accordance with ASTM C754 and GA-216.
3. Metal Stud Spacing: 16 or 24 inches on center as indicated on the drawings.
4. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
5. Coordinate erection of studs with requirements of door frames, window frames, elevator openings; install supports and attachments.
6. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing. Secure wood blocking to studs.

E. Shaft Wall Framing: as indicated in manufacturer's instructions for fire rating specified.

F. Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Indicated Position: 1/8 inch in 10 feet.

C. Maximum Variation From Plumb: 1/8 inch in 10 feet.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Suspended metal grid ceiling system and perimeter trim, acoustic tiles, and accessory components.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
   2. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1: 240. System to accommodate gravity and lateral loads specified in Building Codes.
   3. The suspended ceiling will NOT be used as a return air plenum, and does NOT have to be fire rated.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 08 31 13 - Access Doors and Frames.
   2. Section 09 22 16 – Non-Structural Metal Framing.
   3. Section 09 51 15 – Decorative Wood Grid.
   4. Division 21 - Fire Suppression, Wet Pipe Sprinkler System.
   5. Division 23 - Air Outlets and Inlets.
   6. Division 26 - Interior Lighting.
   7. Division 26 - Fire Detection and Alarm.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   2. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   3. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
   4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   5. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   6. ASTM E336 – Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
   7. ASTM E413 – Classification for Rating Sound Insulation.
   8. 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.

9. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
10. ASTM E1414 – Standard Test Method for Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum.

B. Ceilings and Interior Systems Construction Association (CISCA):
1. CISCA - Acoustical Ceilings - Use and Practice.
2. CISCA – Guidelines for Seismic Restraint for Direct-Hung Suspended Ceiling Assemblies.

C. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
3. NFPA 5000 – Building Construction and Safety Code.

D. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
1. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.
2. Product Data: Submit data on metal grid system components and acoustic units.
3. Samples: Submit two samples, nominal 6x6 inch in size illustrating material, color, texture and edge conditions of acoustic units. Full size samples not required.
4. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.
5. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. Informational Submittals:
1. Product Data: provide Environmental Product Declaration if available.

1.4 QUALITY ASSURANCE

A. Conform to CISCA requirements.

B. Surface Burning Characteristics: Class A; Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84 or UL 723.

C. Qualifications:
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
2. Installer: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

1.5 WARRANTY

A. 30 year limited ceiling systems warranty.

1.6 DELIVERY STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.

1.8 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two boxes of extra acoustic tiles to Owner.

PART 2 PRODUCTS

2.1 SUSPENDED ACOUSTICAL CEILINGS

A. Listed Manufacturer and Product: Armstrong World Industries, Optima Open Plan with Prelude 15/16” Exposed Tee ceiling grid.

B. Other Manufacturers accepted.
1. Celotex Building Products.
2. USG Interiors.

C. Acoustic Panels: Armstrong Optima Open Plan. ASTM E1264, conforming to the following:
1. Size: 24 x 48 inches.
2. Thickness: 3/4 inches.
3. Composition: Mineral fiber.
4. Flame Spread: Class A (UL).
5. Light Reflectance: 0.90.
6. NRC Range: 0.90.
7. Edge: angled tegular.
8. Surface Color: white.
9. Surface Finish: Non-directional, fine-fissured.

D. Metal Grid: Armstrong Prelude 15/16” Exposed Tee ceiling. ASTM C635/C635M, conforming to the following:
1. Non-fire Rated Grid: heavy duty exposed T both directions, components die cut and interlocking.
2. Fire Rated Grid: not used on this project.
3. Exposed Grid Surface Width: nominal half inch.
4. Grid Finish: White.
5. Accessories: Stabilizer bars, clips, splices, perimeter moldings and hold down clips as required for suspended grid system.
6. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

E. Touch-up Paint: Type and color to match acoustic and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify layout of hangers will not interfere with other work.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Lay-In Grid Suspension System:
1. Install system in accordance with ASTM E580/E580M. Install system capable of supporting imposed gravity and seismic loads.
2. Lay out system to balanced grid design with edge units no less than 50 percent of acoustic unit size. Arrange system with long dimension of tile as shown on reflected ceiling plans.
3. Install after major above-ceiling work is complete. Coordinate location of hangers with other work.
4. 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.
5. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers to span extra distance.
6. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or otherwise support components independently.
7. Do not eccentrically load system, or produce rotation of runners.
8. Perimeter Molding:
   a. Install edge molding at intersection of ceiling and vertical surfaces.
   b. Use longest practical lengths.
   c. Overlap and rivet corners.
   d. Install at junctions with other interruptions.
9. Form expansion joints to accommodate plus or minus 1 inch movement. Maintain visual closure.

C. Acoustic Units:
1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
2. Lay directional patterned units in basket weave pattern. Fit border trim neatly against abutting surfaces.
3. Install units after above-ceiling work is complete.
4. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
5. Cutting Acoustic Units:
   a. Cut to fit irregular grid and perimeter edge trim.
   b. Cut edges to match profile of factory edges when field cutting units.
   c. Field paint cut edges to match factory color.
6. Where bullnose or round obstructions occur, install preformed closures to match perimeter molding.

7. Lay acoustic insulation for distance of 48 inches on both sides of acoustic partitions where indicated on drawings.
8. For fire rated systems, install hold-down clips to retain panels tight to grid system, including within six feet of an exterior door.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum variation from flat and level surface: 1/8 inch in 10 feet.

C. Maximum variation from plumb of grid members caused by eccentric loads: 2 degrees.

3.4 SCHEDULE

A. Armstrong Optima Open Plan: Install where shown on reflected ceiling plan drawing A150.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Resilient tile flooring; resilient base.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
2. Resilient flooring to have RFCI Floor Score Certification per ESDS 6.1a.

C. Project Specific Requirements:
1. None.

D. Related Sections:
1. Section 03 30 00 - Cast in Place Concrete.
2. Section 03 54 00 - Cast Underlayment.
3. Section 12 35 00 - Residential Casework.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI 117.1 – Accessible and Useable Buildings.
2. ANSI 332 – Sustainability Assessment for Resilient Floor Coverings.
3. ANSI 1264.2 – Standard for the Provision of Slip Resistance on Walking/Working Surfaces.

B. ASTM International (ASTM):
1. ASTM D1436 – Standard Test Methods for Application of Emulsion Floor Polishes to Substrates for Testing Purposes.
2. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
5. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
6. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
7. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
8. ASTM F1344 - Standard Specification for Rubber Floor Tile.
9. ASTM F1861 - Standard Specification for Resilient Wall Base.
10. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
11. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

C. Certified Floor Covering Installers (CFI)
1. CFI – Resilient Training and Certification.

D. National Fire Protection Association (NFPA):
   1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.
   2. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
   3. NFPA 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
   4. NFPA 5000 – Building Construction and Safety Code.

E. Resilient Floor Covering Institute (RFCI):
   1. RFCI IP#2 – Recommended Installation Practice for Vinyl Composition Tile (VCT).

F. Underwriters Laboratory (UL):
   1. UL 410 – Slip Resistance of Floor Surface Materials.
   2. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions. Include standard line of product for Architect's selection/confirmation of colors.
   2. Samples: Submit two sets of manufacturer's complete set of color samples for Architect's selection/confirmation of colors.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 B.
   4. ESDS Binder: Include manufacturer’s product information showing Floor Score certification and VOC content of adhesives under Criterion 6.1a.

C. Closeout Submittal:
   1. Maintenance data

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes and Stair Coverings: Class I, minimum 0.45 watts/sq cm, or Class II, minimum 0.22 watts/sq cm when tested in accordance with NFPA 253.
   2. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

B. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
   2. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 WARRANTY

A. Provide 5-year product warranty.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F, or as otherwise required by the manufacturer.

C. Maintain conditions above 55 degrees F during installation.

1.7 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish 100 sq ft of flooring and 20 lineal feet of base for each type and color specified.

PART 2 PRODUCTS

2.1 VINYL PLANK FLOORING

A. Listed Manufacturer and Product:
1. TAS Flooring.

B. Vinyl Tile: “Anchor” vinyl plank
1. Glue down installation.
2. Size: 7.25 x 48 inch.
3. Thickness:
   a. 5 mm. overall thickness.
   b. 20 mil. wear layer thickness.
4. Warranty:
   a. 20-year residential product warranty.
   b. 15-year light commercial product warranty.
5. Pattern, Color(s): Selected by the Architect from the full line.
6. Installation Adhesive: Per manufacturer. Comply with VOC limits of Section 01 81 13 – 2.2B.
7. Resilient flooring to have RFCI Floor Score Certification per ESDS 6.1a.
   a. Registration # SCS-FS-07606
8. Adhesive to meet VOC requirements shown in Section 01 81 13 – 2.2 B.
9. Locations:
   a. Install in locations indicated as LVT on finish schedule A620.
   b. Install under ranges in kitchens.
   c. Install under removable sink bases and open sink bases in type A accessible units.

2.2 RESILIENT BASE

A. Manufacturers:
1. Johnsonite.
2. Azrock Commercial Flooring.
3. Roppe Corp.

B. Base: ASTM F1861 Rubber Wall Base; top set coved, solid color throughout.
1. Height: 4 or 6-inch height as shown on the drawings.
2. Finish: Satin.

3. Length: Roll.
4. Accessories: Pre-molded external corners (miter internal corners).
5. Rubber reducer strips at all edges of resilient flooring.
6. Color: Selected by the Architect from the full line.
7. Installation Adhesive: Per rubber tile manufacturer. Comply with VOC limits of Section 01 81 13 – 2.2B.
8. Location:
   a. 4" rubber base where indicated as RB on finish schedule.
   b. 6" rubber base where indicated as RB6 on finish schedule.

2.3 RUBBER TILE FLOORING

A. Listed Manufacturer and Product: Tarkett USA Inc. "Solid Color Rubber Tile."

B. Rubber tile flooring: Standard Rubber Tile per ASTM F-1344
1. Size: 24 x 24 inch.
2. Thickness: 0.155 inch.
3. Floor Score Certification per SCS-FS-01422.
4. Pattern, Color(s):
   a. Pattern: Raised Round.
   b. Color: Selected by the Architect from the full line.
5. Installation Adhesive: Per rubber tile manufacturer. Comply with VOC limits of Section 01 81 13 – 2.2B.
6. Location: Elevator floors and stair landings and where indicated as RT on finish schedule on sheet A620.

2.4 RUBBER TREADS:

A. Listed Manufacturer and Product: Johnsonite Rubber Stair Tread with Integrated Risers.
1. Rubber Tread Pattern: VIRNRDTA - Visually Impaired Raised Round Disk Pattern rubber stair tread with visual strip and integrated riser.
2. Color(s): Selected by the Architect from the full line.
3. Installation Adhesive: Per rubber tile manufacturer. Comply with VOC limits of Section 01 81 13 – 2.2B.
4. Floor Score Certification per SCS-FS-02078.
5. Location: Where indicated as RTR on finish schedule on sheet A620.

2.5 ACCESSORIES

A. Subfloor Filler: Cementitious or premix latex, type recommended by adhesive material manufacturer and flooring manufacturer, Low-VOC.

B. Primers and Adhesives: Waterproof, Low-VOC per Section 01 81 13, types recommended by flooring manufacturer.

C. Moldings and Edge Strips: Same material as flooring, unless otherwise indicated.

D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify concrete floors are dry to maximum moisture content as recommended by flooring manufacturer, and exhibit negative alkalinity, carbonization, and dusting.

C. An adhesive bond test shall be performed and passed prior to beginning installations.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. Note that some manufacturers require only Portland cement based patching and leveling materials be used for their products.

B. Prohibit traffic until filler is cured.

C. Clean substrate.

D. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed. Apply primer to surfaces required by the manufacturer.

3.3 INSTALLATION - TILE FLOORING

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Install tile flooring at locations indicated on Drawings, including floor of elevator cab; see Section 14 24 23.

C. Mix tile from container to ensure shade variations are consistent when tile is placed.

D. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern. If opposing walls are not parallel, notify Architect for instructions.

E. Install tile to grid pattern with tight joints. Allow minimum 1/2 full size tile width at room or area perimeter.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

G. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

I. Install flooring in recessed floor access covers. Maintain floor pattern.

J. At movable partitions, install flooring under partitions without interrupting floor pattern.

K. Install feature strips and floor markings where indicated. Fit joints tightly.

3.4 INSTALLATION - BASE

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Provide around entire perimeter of room or space, including behind equipment. Include at casework, columns, and all other projections except where otherwise indicated.

C. Fit joints tightly and make vertical. Install roll stock, and maintain minimum dimension of 18 inches between joints.

D. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

E. Install base on solid backing. Bond tightly to wall and floor surfaces.

F. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Remove excess adhesive from floor, base, and wall surfaces without damage.

C. Clean, seal, and maintain resilient flooring products.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Prohibit traffic on resilient flooring for 48 hours after installation.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Modular carpet tile and adhesive.

B. Performance Requirements:
1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
2. Carpet must be CRI Green Label Plus certified per the requirements of ESDS Criterion 6.01a.

C. Project Specific Requirements: None.

D. Related Sections:
1. Section 03 54 00 - Cast Underlayment.
2. Section 06 20 00 - Finish Carpentry.
3. Section 09 65 16 - Resilient Sheet Flooring.
4. Section 09 65 19 - Resilient Tile Flooring.

1.2 REFERENCES

A. Carpet and Rug Institute:
1. CRI – Carpet Installation Standard.

B. Certified Floor Covering Installers (CFI)
1. CFI – Carpet Training and Certification.

C. Consumer Products Safety Commission:
1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.

D. National Fire Protection Association:
1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

E. NSF International (NSF)
1. ANSI/NSF 140 – Sustainable Carpet Assessment Standard.

F. Underwriters Laboratory (UL):
1. UL 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
2. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. ESDS Binder: Per section 01 81 13 – 1.6.
1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Certification that carpet tile meets Carpet and Rug Institute's Green Label Plus standard per ESDS Criteria 6.01a.
4. Include manufacturer's product information showing compliance with VOC limits under Criterion 6.01a per 01 81 13 – 1.6 C 12. See 01 81 13 – 2.2 B for VOC requirements.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Striping: 12-inch- long Samples.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial I certification level.

1.5 WARRANTY

A. Section 01 70 00 – Executing and Closeout Requirements: Product warranties and product bonds.

B. One-year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.7 ENVIRONMENTAL REQUIREMENTS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

PART 2 PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design: Subject to compliance with requirements provide products by the following:
   1. Patcraft, PO Box 2128 Dalton, GA 3072-2128

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Patcraft “Deconstructed Collection”

D. Fiber Content: Eco Solution Q Nylon.

E. Dye Method: 100% Solution Dyed.

F. Primary Backing/Backcoating: Manufacturer's standard composite materials.

G. Density: 6698 oz/yd3.

H. Certification: Carpet tile meets Carpet and Rug Institute’s Green Label Plus (GLP9968)

I. ADA Compliance: Carpet meets the recommended static coefficient of friction for ADA walking surfaces and accessible routes.

J. Locations: where indicated as CT on finish schedule on drawing sheet A620.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
   1. Adhesives shall have a VOC content per Sustainability Design Requirements. See 01 81 13 – 2.2 B.

C. Metal Edge/Transition Strips: Extruded aluminum with mil finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
   1. Moisture Testing: Perform tests per manufacturer’s written installation instructions.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fil cracks, holes, depressions, and protrusions in substrates. Fil or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, non-staining marking device.

H. Location: Install where indicated as CTP-1 on finish schedule in drawings.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 72 00

WALL COVERINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Surface preparation and installation of FRP wall coverings at janitor's closets and locations indicated on drawings.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project specific requirements:
   1. None.

D. Related Sections:
   1. Section 07 90 00 - Joint Protection
   2. Section 09 21 16 - Gypsum Board Assemblies.
   3. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D570-98 - Test Method for Water Absorption of Plastics.
   2. ASTM D638 - Test Method for Tensile Properties of Plastics.
   3. ASTM D695 - Test Method for Compressive Properties of Rigid Plastics.
   4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   5. ASTM F793 - Standard Classification of Wallcovering by Durability Characteristics.

B. National Fire Protection Association:
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
   2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

C. Underwriters Laboratories Inc.: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit performance data on product.
   2. Samples: submit two samples of selected color/texture, 6"x6" size of each selection.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. Informational Submittals:
   1. Environmental Product Declaration, if available.

D. Closeout Submittals:
   1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
   2. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.4 QUALITY ASSURANCE

A. Verify field measurements prior to fabrication.

B. Surface Burning Characteristics:
   1. Textile Wall Coverings: Comply with one of the following:
      a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
      b. Comply with requirements of applicable code when tested in accordance with NFPA 265 Method A or Method B test protocols.

C. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
   2. Installer: Company or individual specializing in performing work of this section with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 – Executing and Closeout Requirements: Product warranties and product bonds.

B. One-year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Inspect materials on site to verify acceptance.

C. Protect packaged adhesive from temperature cycling and extreme temperatures.

D. Store roll goods consistent with manufacturer's instructions.

E. Protect surface during cutting and working.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by adhesive or vinyl covering product manufacturer.

C. Maintain these conditions 24 hours before, during, and after installation of adhesive and covering.

1.8 COORDINATION

A. Section 01 30 00 – 1.2: Coordination

PART 2 PRODUCTS

2.1 FIBER REINFORCED PLASTIC (FRP) WALL COVERING

A. Manufacturers:
   1. Crane Composites Company.
   2. Nudo Products, Inc.

B. Crane Composite, Classic Collection “Varietex.”

C. Wall Covering: Fiberglass Reinforced Plastic wall panel, USDA approved for installation in commercial kitchens. Corrosion and impact resistant and resistant to moisture, stains, odors and chemicals.

D. Color: selected by the Architect from manufacturer’s standard line.

E. Adhesive: contact adhesive type recommended by covering manufacturer to suit application to substrate, water based contact type, low-VOC per 01 81 13-2.2.

F. Plastic or Vinyl Mold Trims: manufacturer’s standard ‘J’ mold at outer perimeter and ‘H’ or ‘T’ molds at intersecting edges of size and type appropriate to installation.

G. Texture: Sandstone

H. Colors: Per Architect from manufacturer’s standard line of colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are ready to receive work, and conform to requirements of covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet, nor vary at rate greater than 1/16 inch/ft.

3.2 PREPARATION FOR WALL COVERINGS

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

C. Surfaces: Correct defects and clean surfaces which affect work of this section.

D. Marks: Seal with shellac those which may bleed through surface finishes.

E. If required by manufacturer, apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

F. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION OF FRP WALL COVERING

A. The following represent general procedures. In all cases comply with manufacturer's written instructions.

B. Apply adhesive in accordance with manufacturer's direction. Apply to 100 % of substrate surface to receive wall panels. Allow no voids in adhesive.

C. Install to plumb and level, regardless of adjacent wall surfaces and corners. Trim panels as necessary. Gap panels according to manufacturer's recommendations.

D. Install panels full height in one piece. No horizontal joints allowed.

E. Include continuous edge trim at outer perimeter and 'H' or 'T' molds at joints between panels.

F. Set panels in full bed of troweled adhesive. Ensure full, uniform contact at all surfaces, without wrinkles, gaps or overlaps.

G. Make neat cutouts for plumbing and electrical rough-ins. Make openings slightly larger than the pipe or conduit so that trim boxes or escutcheon plates completely cover opening in panel.

H. Remove excess adhesive while wet from seam before proceeding to next panel. Wipe clean with dry cloth.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean coverings of excess adhesive, sealants, dust, dirt, and other contaminants without damaging finished surface.

C. Reinstall wall plates and accessories removed prior to work of this section.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 91 13

EXTERIOR PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Surface preparation and field application of exterior paints and other coatings.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 08 11 15 - Hollow Metal Doors and Frames.
   2. Section 07 46 00 – Fiber Cement Siding
   3. Section 09 96 00 – High Performance Coatings

E. Definitions:
   1. Conform to ASTM D16 for interpretation of terms used in this section.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D523 – Standard Test Method for Specular Gloss
   2. ASTM D913 – Standard Practice for Evaluating Degree of Traffic Paint Line Wear.
   3. ASTM D1729 – Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials.
   4. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
   5. ASTM D3960 – Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
   6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. National Fire Protection Association (NFPA):
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
   2. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
   3. NFPA 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

C. SSPC: The Society for Protective Coatings
   1. MPI Architectural Painting Specification Manual

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Action Submittals:
   1. Product Data: Submit data on finishing products.
   2. Samples:
      a. Submit two painted samples (draw-downs) illustrating selected colors for each color and system selected. Submit on illustration board stock 8x10 inch size.
      b. Before commencing with work, prepare samples on final substrate on building. Size not less than 5’ x 5’.
   3. Manufacturer's Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.

C. Closeout Submittals
   1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
   2. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
   3. Submit itemized list complete with manufacturer, paint type and color-coding for all colors used for Owner’s later use.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Fire Retardant Finishes
   1. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Qualifications
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
   2. Applicators: Company specializing in performing work of this section with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 – Executing and Closeout Requirements: Product warranties and product bonds.

B. One-year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. 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.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.8 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Supply ten gallons of paint in each exterior body color, two gallons of paint in each exterior trim color.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers: Paint and Transparent Finishes.
1. Benjamin Moore.
2. Sherwin Williams.
3. Rodda Paints.
4. The Glidden Co.

2.2 COMPONENTS

A. Coatings: Ready mixed, except field-catalyzed coatings. Prepare coatings:
1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

B. Chemical Content: The following compounds are prohibited:
1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate conditions are ready to receive Work as instructed by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums allowed by coating manufacturer or:
   1. Gypsum Wallboard: 12 percent measured in accordance with ASTM F2659.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent measured in accordance with ASTM F2659.
   3. Wood – interior and exterior: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors: 8 percent measured in accordance with ASTM F2659.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

C. Do not apply finishes to the following materials:
   1. Metals as listed: brass, bronze, copper, plated metals, stainless steel, anodized aluminum.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

C. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE - EXTERIOR SURFACES

A. Exterior metal: See specification section 09 96 00 – High Performance Coatings.

B. Pavement Markings:
1. Latex, waterborne emulsion, complying with FS TT-P-1952 with drying time of less than 45 minutes. White traffic paint, except where other colors required by authority having jurisdiction. See also Section 33 46 13.

C. Fiber Cement Soffits:
1. Follow fiber cement siding manufacturer's printed painting instructions.
2. Latex System – MPI EXT 3.3A G2
   a. Prime Coat: MPI 214, water based latex primer.
   b. Intermediate Coat: MPI 214, water based latex intermediate coat.
   c. Topcoat: MPI 214, water based latex top coat.

D. Fiber Cement Plank and Panel Siding and trim:
1. Follow fiber cement siding manufacturer's printed painting instructions.
2. Latex System – MPI EXT 3.3A G2.
   a. Prime Coat: MPI 214, water based latex primer.
   b. Intermediate Coat: MPI 214, water based latex intermediate coat.
   c. Topcoat: MPI 214, water based latex top coat.

3.6 SCHEDULE - COLORS

A. As directed by Architect in separate document.

B. Minimum of five colors for exterior color schemes (field and trim colors).

3.7 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Surface preparation and field application of paints, stains, varnishes, and other coatings. Also included are shop applied transparent finishes for interior millwork, doors and frames.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. All interior paints, stains and coatings to comply with the requirements of ESDS Criterion 6.01a.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 05 50 00 - Metal Fabrications.
   2. Section 06 20 00 - Finish Carpentry.
   3. Section 08 11 15 - Hollow Metal Doors and Frames.
   4. Section 08 14 16 - Flush Wood Doors.
   5. Section 08 14 33 - Stile and Rail Wood Doors.
   6. Section 09 21 16 - Gypsum Board Assemblies.
   7. Section 09 72 00 - Wall Coverings.
   8. Division 22 - Identification for Plumbing Piping and Equipment.
   9. Division 23 - Identification for HVAC Piping and Equipment.
   10. Division 26 - Identification for Electrical Systems.

E. Definitions:
   1. Conform to ASTM D16 for interpretation of terms used in this section.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
   2. ASTM D523 – Standard Test Method for Specular Gloss
   3. ASTM D1729 – Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials.
   4. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
   5. ASTM D3450 – Standard Test Method for Washability Properties of Interior Architectural Coatings.
   6. ASTM D3960 – Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
   7. ASTM D4209 – Standard Practice for Determining Volatile and Nonvolatile Content of Cellulosics, Emulsions, Resin Solutions, Shellac, and Varnishes.

8. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
11. ASTM E2129 – Standard Practice for Data Collection for Sustainability Assessment of Building Products.

B. National Fire Protection Association (NFPA):
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
2. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
3. NFPA 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

C. SSPC: The Society for Protective Coatings
1. MPI Architectural Painting Specification Manual

D. Underwriters Laboratories Inc. (UL):
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
2. UL Green Guard Certification Program.

E. Green Seal: GS-11 Green Seal Environmental Standard for Paints and Coatings.

F. Scientific Certification Systems, Inc. Indoor Air Quality Certification.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Action Submittals:
1. Product Data: Submit data on finishing products.
2. Samples:
a. Submit four painted samples (draw-downs) illustrating selected colors for each color and system selected. Submit on illustration board stock 8x10 inch size.
b. Submit two samples of wood door veneer with shop-applied transparent finish, 8x10 inch size, illustrating wood grain, stain color and sheen. Refer to Section 08 14 16 and 08 14 33.
c. Before commencing with work, prepare samples on final substrate on building. Size not less than 5’ x 5’.
3. Manufacturer's Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.

C. ESDS Binder:
1. ESDS requirement: Provide proof of certification by UL GreenGuard Gold or SDS Indoor Advantage Gold for each interior paint or coating per Section 01 81 13 – 1.6 C 12.

D. Closeout Submittals
1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
2. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

3. Submit itemized list complete with manufacturer, paint type and color-coding for all colors used for Owner's later use.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Fire Retardant Finishes
   1. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. All interior paints or coatings to be certified UL GreenGuard Gold or SCS Indoor Advantage Gold.

C. Qualifications
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
   2. Applicators: Company specializing in performing work of this section with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 – Executing and Closeout Requirements: Product warranties and product bonds.

B. One-year standard warranty on product and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. 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.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.8 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Supply 20 gallons for each interior paint color and type; store where directed.

C. Supply 5 gallons for each interior accent or trim paint color and type, store where directed.

D. Label each container with color, type, texture, and room locations in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers: Paint and Transparent Finishes.
   1. Sherwin Williams.
   2. Benjamin Moore.
   3. Rodda Paints.
   4. The Glidden Co.

2.2 COMPONENTS

A. Coatings: Ready mixed, except field-catalyzed coatings. Prepare coatings:
   1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
   2. For good flow and brushing properties.
   3. Capable of drying or curing free of streaks or sags.

B. Low VOC content: UL GreenGuard Gold or SCS Indoor Advantage certification required for each paint.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate conditions are ready to receive Work as instructed by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums allowed by coating manufacturer or:
   1. Gypsum Wallboard: 12 percent measured in accordance with ASTM F2659.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent measured in accordance with ASTM F2659.
   3. Wood – interior and exterior: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors: 8 percent measured in accordance with ASTM F2659.

3.2 PREPARATION

A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
   1. After painting reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

B. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

3.3 APPLICATION

A. In general, strictly comply with coating manufacturer's printed instructions and recommendations in "MPI Architectural Painting Specification Manual."

B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

C. Finishing Mechanical and Electrical Equipment (exposed to view in the finished work):
   1. Refer to Division 22 and 26 for schedule of color coding and identification banding of equipment, duct work, piping, and conduit.
   2. Paint shop primed equipment.

D. Do not apply finishes to the following materials:
   1. Metals as listed: brass, bronze, copper, plated metals, stainless steel, anodized aluminum.
   2. Plastic laminate and FRP wall coverings.
   3. Materials having a complete factory finish including: electrical switch plates, lighting fixtures, and finish hardware.
   4. Finished cabinets.
   5. Pre-finished wood.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

A. Metal Fabrications Section 05 50 00: Exposed surfaces of lintels, miscellaneous clips and fasteners, and other non-factory finished metal surfaces.

3.6 SCHEDULE - INTERIOR SURFACES

A. Wood – Opaque Finish:
   1. Institutional Low Odor / Low VOC – MPI INT 6.3V G3.
      a. Base Coat: MPI 39, Latex Wood Primer.
      b. Intermediate Coat: MPI 145, Institutional Low Odor / VOC.
      c. Top Coat: MPI 145, Institutional Low Odor / VOC.
   2. G3 Eggshell Sheen.

B. Steel - Primed:
   1. Low odor / VOC system – MPI INT 5.1S G3:
      a. Prime Coat: MPI 107, Rust Inhibitive Primer, Waterborne.

b. Intermediate Coat: MPI 107, Rust Inhibitive Primer, Waterborne.
c. Topcoat: MPI 145, Institutional Low Odor / Low VOC.
d. G3 Eggshell sheen.

C. Steel - Galvanized.
1. Water-Based Light Industrial Coating System – MPI INT 5.3M G4.
a. Prime Coat: MPI 134, W.B. Galvanized Primer.
b. Topcoat: MPI 140 HIPAC Latex.
2. G4 Satin Sheen.

D. Fire sprinkler piping (steel or PVC), electrical conduit, cable tray (when exposed to view in the finished work):
1. Low odor / VOC Latex system - MPI INT 6.8EE G5:
a. Prime Coat: MPI 17, Bonding Primer, Waterborne, low odor/VOC.
b. Top Coat: MPI 54, Latex, low odor/VOC.
2. G5 Semi-Gloss Sheen.

E. Fire sprinkler piping (steel), electrical conduit, cable tray when exposed to view in the finished work:
1. Low odor / VOC system – MPI INT 5.1S G3:
a. Prime Coat: MPI 107, Rust Inhibitive Primer, Waterborne.
b. Intermediate Coat: MPI 107, Rust Inhibitive Primer, Waterborne.
c. Topcoat: MPI 145, Institutional Low Odor / Low VOC.
2. G3 Eggshell sheen.

F. Gypsum Board Walls and Ceilings:
1. Low-Odor/VOC Latex System – MPI INT 9.2A:
a. Prime Coat: MPI 50, Tinted latex Primer / Sealer, low odor/VOC.
b. Topcoat: MPI 52, Latex, low odor/VOC, matching topcoat.
2. G3 Eggshell sheen in all locations except bathrooms. G4 satin sheen in bathrooms.

G. Wall Surfaces Behind Wall Covering:
1. Low-Odor/VOC Latex System:
a. Prime Coat: MPI 50 Latex Primer / Sealer, low odor/VOC.

3.7 SCHEDULE - COLORS

A. As directed by Architect in separate document:
1. Common Rooms: Two wall colors, two trim colors, and two accent wall colors. See finish schedule.
2. Residential Units: One color for interior walls and ceilings.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 09 96 00

HIGH-PERFORMANCE COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Surface preparation and field application of high-performance coating systems on the following substrates:
      a. Steel.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Site applied paints and coatings inside the air barrier to be certified UL Green Guard Gold or SCS Indoor Advantage Gold per ESDS criteria 6.01a.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 05 50 00 - Metal Fabrications.
   2. Section 08 11 15 - Hollow Metal Doors and Frames.

E. Definitions:
   1. Conform to ASTM D16 for interpretation of terms used in this section.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D523 – Standard Test Method for Specular Gloss
   2. ASTM D1729 – Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials.
   3. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
   4. ASTM D3960 – Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

B. SSPC: The Society for Protective Coatings
   1. MPI Architectural Painting Specification Manual

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Action Submittals:
   1. Product Data: Submit data on finishing products.
   2. Samples:
      a. Submit four painted samples (draw-downs) illustrating selected colors for each color and system selected. Submit on illustration board stock 8x10 inch size.
      b. Before commencing with work, prepare samples on final substrate on building. Size not less than 1’ x 1’.

3. Manufacturer's Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.

C. ESDS Binder:
1. Paint Certification: Provide proof of UL Greenguard Gold or SCS Indoor Advantage Gold certification for site-applied paints inside the air barrier per Section 01 81 13 – 1.6 C 12.

D. Closeout Submittals
1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
2. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
3. Submit itemized list complete with manufacturer, paint type and color-coding for all colors used for Owner’s later use.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Fire Retardant Finishes
1. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Qualifications
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
2. Applicators: Company specializing in performing work of this section with minimum three years experience.

1.5 WARRANTY

A. One year standard warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. 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.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.8 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.1 HIGH-PERFORMANCE PAINTS AND COATINGS

A. Manufacturers: Paint.
1. Sherwin Williams.

B. Product Basis of Design: Sherwin Williams Pro Industrial DTM Acrylic Coating.
1. Substitutions: per 01 60 00 product requirements.

C. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

2.2 HIGH-PERFORMANCE CLEAR COATING

A. Manufacturers: Transparent Finishes.
1. PPG Paints.

B. Product Basis of Design: PPG Paints PSX 700A Clear Coat.
1. Substitutions: per 01 60 00 product requirements.
2. Two-Component engineered polysiloxane clearcoat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate conditions are ready to receive Work as instructed by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

C. Do not apply finishes to the following materials:
   1. Metals as listed: brass, bronze, copper, plated metals, stainless steel, anodized aluminum.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

C. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

A. Metal Fabrications Section 05 50 00: Exposed surfaces of lintels, exterior canopies, trellises, railings, miscellaneous clips and fasteners, and other non-factory finished metal surfaces.

3.6 SCHEDULE - EXTERIOR SURFACES

A. Metal fabrications: Exposed surfaces of lintels, bent metal details, miscellaneous clips and fasteners and other non-factory finished metal surfaces.
   1. Opaque Coating: Light Industrial Coating System MPI EXT 5.1F:
      a. Prime Coat: Primer, Alkyd Primer, MPI #79.
      b. Intermediate Coat: W.B. Light Industrial Coating, MPI #164.
      c. Topcoat: W.B. Light Industrial Coating, MPI #164.

2. Clear Coat: Protective Coating
   a. Intermediate Coat: Protective and Marine Coating, MPI #205.
   b. Topcoat: Protective and Marine Coating, MPI #205

3.7 SCHEDULE - COLORS

A. As directed by Architect in separate document.

3.8 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Supplying and installing exterior and interior signs, non-illuminated. Signs include unit numbers, wayfinding in corridors, life safety signs, room identifications and all other signs required by code.

B. Performance Requirements:
   1. All signs to comply with ANSI A117.1.
   2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 06 20 00 - Finish Carpentry.
   2. Section 09 90 00 - Painting and Coatings.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign, and installation instructions.
   2. Samples: Submit two signs, full size sample, illustrating type, style, letter font, and colors specified; method of attachment.
   3. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

1.4 WARRANTY

A. Standard one-year warranty on products and workmanship.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Package signs, labeled in name groups.

C. Store adhesive products at ambient room temperatures.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

1.7 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Supply four additional unisex accessible restroom signs.

PART 2 PRODUCTS

2.1 EXTERIOR AND INTERIOR SIGNS

A. Listed Manufacturers:
1. Vertical Visual Solutions, Mountlake Terrace, WA. (interior signs).
2. Gemini Incorporated, Cannon Falls, MN (exterior cast metal signs).

B. Other Manufacturers:
1. Great Graphics and Signs Inc., Puyallup, WA
2. Meyer Signs, Seattle, WA.

2.2 MATERIALS – INTERIOR ACRYLIC SIGNS

A. Typical exterior stair signs: one line of text, size and character height as shown on Drawings. Raised characters and Grade 2 Braille on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Font to be Helvetica. Second surface applied full color digital print as supplied by Architect. See detail 3 on sheet A625. Provide in number and location shown in schedule on sheet A620.

B. Stairway identification: located and installed at each floor landing at each stairway. Raised characters on 1/8” non-glare acrylic face, size 8” x 12”, character height as shown on Drawings. See detail 4 on sheet A625. Provide in number and location shown in schedule on sheet A620. Must include the following information per IBC 1023.9.1 and IBC Standard 33-2.
1. Stairway location.
2. Upper terminus (“Roof Access”).
3. Floor level numerals.
4. Upper and lower terminus of stairway by floor number.

C. Elevator Placard: Located and installed at each floor above elevator call button. Flush characters on 1/8” non-glare acrylic face. Size, design and characters per City of Yakima requirements. See detail 9 on sheet A625. Provide in number and location shown in schedule on sheet A620. .

D. Two-way communication: Located and installed at each floor at area of refuge. Flush characters on 1/8” non-glare acrylic face. Size, design and characters per City of Yakima requirements. Provide 3 signs.

E. Typical room signs: two lines of text, size and character height as shown on Drawings. Raised characters and Grade 2 Braille on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Font to be Helvetica. Two face colors as selected by Architect. Size: 8” W x 6” H. Second surface applied full color digital print as supplied by Architect. See detail 2 on sheet A625. Provide in number and location shown in schedule on sheet A620. .

F. Typical residential unit signs: one line of text, size and character height as shown on Drawings. Raised characters and Grade 2 Braille on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Font to be Helvetica. Two face colors as selected by Architect. Size: 6” W x 4” H. Second surface applied full color digital print as supplied by Architect. Number: one per studio unit and two per one-bedroom and two-bedroom units. See detail 6 on sheet A625. Provide in number and location shown in schedule on sheet A620.

G. Rest Room ADA Sign: located and installed adjacent to Rest Rooms 156b, 159, 160 and 171. Raised characters and Grade 2 Braille on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Font to be Helvetica. White text and blue background per Washington State Code. Include standard bathroom and international access symbols. See detail 5 on sheet A625. Provide in number and location shown in schedule on sheet A620.

H. Fire Department Required Signs: located and installed where required. Raised characters on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Font to be Helvetica. White text and red background. See detail 7 on sheet A625. Provide in number and location shown in schedule on sheet A620.

I. Office sign: one line of text, size and character height as shown on Drawings. Raised characters and Grade 2 Braille on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. Name insert acrylic sleeve over sign backing. Font to be Helvetica. Two face colors as selected by Architect. See detail 11 on sheet A625. Provide in number and location shown in schedule on sheet A620.

J. Max Occupancy Sign: located and installed in room 111. Raised characters on 1/8" non-glare acrylic face. Backing is 1/8" acrylic. Characters raised 1/32" and comply with ADA requirements. One face color as selected by Architect. See detail 10 on sheet A625. Provide in number and location shown in schedule on sheet A620.

K. No smoking signs:
1. Interior: standard no smoking symbol. 1/8” acrylic. Number: allow eight signs. Locate per owner in common rooms on level 1 and laundry rooms.

2. Exterior: standard no smoking symbol with text “No smoking within 25 feet of entry”. Number: allow four signs. Locate at entry doors.

2.3 EXTERIOR ADDRESS SIGNS

A. Building Address**:** Vinyl letter address, black color “Helvetica” font characters (or as required by Yakima Fire Department). Allow two locations with five characters each.
1. Mounting: Adhere to glass for exterior door.
2. Location: doors 132A and Door 115A.

2.4 EXTERIOR BUILDING SIGNS

A. YHA Office Sign: Gemini cast aluminum sign letters, Avant Garde font, 18” high, paint with custom color. Stud mount to exterior siding. Sign to spell “Yakima Housing Authority.”

B. YHA Monument Sign: Single sided 3mm thick aluminum sign printed with UV ink. 5’-0” long and 2’-9” high. Two signs, one per side. Mounted to monument sign with stand-offs.

C. Residential Building Sign: Single sided 3mm thick aluminum sign printed with UV ink. 7’-0” long and 1’-6” high. Mounted to wall with stand-offs. Two signs, located at entry doors 132A and 133A.

2.5 ACCESSORIES

A. Adhesive for interior signs: Clear silicone construction adhesive. Other types as recommended by the signage installer and approved by the architect. Low-VOC required per section 01 81 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 INSTALLATION

A. Install signs after doors are installed and wall surfaces are finished, in locations scheduled.

B. Position sign on wall surface adjacent to the strike side of the door, unless otherwise indicated. Set with maximum 3" between edge of sign and edge of door casing, and maximum 60" to the top of the sign above the finished floor. If sign cannot be installed as indicated, obtain direction from Architect.

C. Set level and plumb.

3.3 SCHEDULES

A. See Drawings for sign schedule.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section:
   1. Residential toilet accessories; common toilet accessories, shower room accessories; and utility room accessories.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 08 80 00 - Glazing.
   3. Section 10 21 15 - Plastic Toilet Compartments.

1.2 REFERENCES

A. ASTM International:
   1. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   2. ASTM C1036 - Standard Specification for Flat Glass.

B. Federal Specification Unit: FS A-A-3002 - Mirrors, Glass.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
   2. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.
   3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. 01 40 00 – Quality Requirements.

1.5 WARRANTY

A. One-year standard warranty on product and workmanship.

1.6 DELIVERY STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS.

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Listed Manufacturer: Bobrick Washroom Accessories, Inc., unless otherwise noted.

B. Other Manufacturers:
   1. American Specialties, Inc.
   2. Bradley Corp.
   3. World Dryer Corp.

2.2 COMPONENTS

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. Grind welded joints smooth. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Mirror Glass: Refer to Section 08 80 00.

C. Adhesive: Silicone, waterproof.

D. Fasteners, Screws, and Bolts: Stainless steel, tamper-proof.

E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

F. Finish: as noted below, all items factory finished ready for field installation.

2.3 PUBLIC & NON-RESIDENTIAL BATHROOM ACCESSORIES

A. Toilet Paper Dispenser: American Specialties, Inc. “Jumbo-Roll” 0040. Holds two 9” diameter rolls. Door cabinet and mounting plate fabricated of 18 gauge type 304 satin-finish stainless steel. Supply one dispenser per toilet.

B. Touchless Towel Dispenser: Georiga Pacific “enMotion” 59462, surface mounted. Provide one per common bathroom.

C. Soap Dispenser: Bobrick B-4112, liquid soap dispenser, surface-mounted, vandal resistant; container is satin-finish stainless steel. Concealed wall fastening; hinged filler top requires special key to open. Liquid capacity: 40 ounces. Provide one per bathroom.

D. Grab Bars: Bobrick B-6806 Series, satin-finish stainless steel, 1-1/2 inches outside diameter, nonslip grasping surface finish, concealed mounting with snap-flange; 1-1/2 inches clearance between wall and inside of grab bar. Lengths, configurations and locations as indicated on drawings.
   1. Locations:

a. One set of grab bars per 9/G063 in public bathrooms 123, 124, 127, 107.

E. Waste Receptacle: Bobrick B-277 Surface mounted waste receptacle. Provide one per bathroom.

F. Mirror: Bobrick B-1658 2436 Tempered Glass Channel Frame, 24” Wide X 36” High size. Provide one per sink.

G. Toilet Seat Cover Dispenser: Bobrick B-4221 Surface Mounted Seat Cover Dispenser. Provide one per toilet.

H. Baby Changing Station: KB300-SS Horizontal Surface Mounted Changing Station. Color: Grey 01. Provide one in each of the following rooms: 127, 107, 122.

2.4 RESIDENTIAL BATHROOM ACCESSORIES (Typical residential unit bathroom)

A. Toilet Paper Dispenser: Bobrick B-7685, surface mounted; bright-polished stainless steel. Support-arm flanges lock to concealed stainless steel wall plate.

B. Towel Bar: Bobrick B-530, bright-polished stainless steel, in 18” and 24” lengths, as indicated on Drawings. Round tubular bar, 1” diameter; project 1-1/2” from wall.

C. Shower curtain rod: Bobrick B-207, 1” diameter, 20-gauge stainless steel rod; flanges to be 1-5/8” chrome plated plastic mounted on concealed wall brackets supplied with unit.

D. Grab Bars: Bobrick B-6806 Series, satin-finish stainless steel, 1-1/2 inches outside diameter, nonslip grasping surface finish, concealed mounting with snap-flange; 1-1/2 inches clearance between wall and inside of grab bar. Lengths, configurations and locations as indicated on drawings. Install grab bars in type A accessible units.

1. Locations:
   a. One set of grab bars per 3/G064 in each residential apartment bathroom with a bathtub. Install in both ADA and non-ADA units.
   b. One set of grab bars per 2/G064 in each residential apartment bathroom with a shower.
   c. One set of grab bars per 8/G064 in each residential apartment. Install in both ADA and non-ADA units.

2.5 JANITOR CLOSET ACCESSORIES

A. Mop and Broom Holder: Bobrick B-223, surface mounted satin stainless steel, spring loaded rubber cams with steel retainers, length 24" (model B-223x24). Provide and install one units in each of the following rooms: 110A.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify exact location of accessories for installation.

C. Verify field measurements are as indicated on product data.

D. Verify that blocking has been installed in walls behind accessories.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights and Locations: As indicated on Drawings. If location is not indicated, notify Architect for direction. Note that swing-up grab bars are to be provided but not installed.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fire extinguishers, fire extinguisher cabinets; and brackets for wall mounting.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.
   2. Conform to NFPA 10.
   3. Provide extinguishers and cabinets classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.

C. Project Specific Requirements: None

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 09 21 16 - Gypsum Board Assemblies.
   3. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. National Fire Protection Association: NFPA 10 - Standard for Portable Fire Extinguishers.

B. Underwriters Laboratories Inc.: UL - Fire Protection Equipment Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, location, and fire ratings.
   2. Product Data: Submit extinguisher operational features, color and finish, and anchorage details.
   3. Manufacturer's Installation Instructions: Submit special criteria and wall opening coordination requirements.
   4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. Closeout Submittals
   1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
   2. Operation and Maintenance Data: Submit test, refill or recharge schedules and re-certification requirements.

1.4 QUALITY ASSURANCE

1.5 WARRANTY

A. Manufacturer's standard warranty one-year warranty.

1.6 DELIVERY STORAGE AND HANDLING

1. See 01 60 00.
2. Storage and handling per manufacturer’s written requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install extinguishers when ambient temperature is capable of freezing extinguisher ingredients.

1.8 ADDED MATERIALS

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Manufacturers:
1. Potter Roemer.
2. Amerex Fire Extinguishers
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Extinguishers for Common Areas:
1. Potter Roemer 3005 ABC Dry Chemical type. Cast steel tank with pressure gage; 5 lb; Finish: red.
2. Mounted in cabinet per 2.2.
3. Allow for eleven fire extinguishers, locate per plan.
   a. Cubicle Flex Space 129
   b. Community Room 111
   c. Laundry Room 110
   d. Level 1 Residential Corridor (2 extinguishers)
   e. Level 2 Residential Corridor (2 extinguishers)
   f. Level 3 Residential Corridor (2 extinguishers)
   g. Level 4 Residential Corridor (2 extinguishers)

C. Extinguishers for Mechanical and Electrical Rooms:
1. Potter Roemer B456 ABC Dry Chemical Type: Cast steel tank with pressure gage; 10 lb; Finish: red.
2. Mounting with bracket.
3. Allow for three fire extinguishers, locate per owner direction.
   a. Electrical Room 109
   b. Plumbing Room 108

D. Extinguishers for Residential Units
1. Kidde ABC Dry Chemical Type.
2. Mounting with included bracket.

3. Multipurpose Home Fire Extinguisher FA110G
4. One per residential apartment.

2.2 FIRE EXTINGUISHER CABINETS

A. Manufacturers: Same as for extinguishers.

B. Cabinet: Formed sheet steel; Semi-recessed type, with flat trim nominal 1" wide face, sized to accommodate extinguisher.
   1. Basis of design Potter Roemer Model 7007-7029: Steel – Galvannealed Steel with white polyester finish.

C. Door: 0.016 inch thick, reinforced for flatness and rigidity; Door glazing: plastic, clear, 1/8 inch thick acrylic or polycarbonate.

D. Cabinet Mounting Hardware: Appropriate to cabinet.

E. Hinge doors for 180 degree opening with continuous piano hinge. Furnish nylon roller type catch and latch.

F. Weld, fill, and grind components smooth.

G. Finish for cabinet interior: White baked enamel, factory finish.

H. Finish for door and trim: Brushed stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Install cabinets plumb and level in wall openings, maximum 48 inches from finished floor to top of extinguisher handle.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

E. Position cabinet signage as required by authorities having jurisdiction.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 10 55 13

POSTAL SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Post mounted exterior postal equipment as shown on the Drawings.

B. Performance Requirements:
   1. Comply with USPS Standard 4-C.
   2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 06 20 00 - Finish Carpentry.
   2. Section 09 90 00 - Painting and Coatings.

1.2 REFERENCES

A. USPS-STD-4C - United States Postal Service Standard 4C, Wall-Mounted Centralized Mail Receptacles.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Shop Drawings: Indicate locations, construction and anchorage details, dimensions, rough-in openings sizes, number and arrangement of box sizes.
   2. Product Data: Submit data for components.
   3. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.
   4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Conform to U.S. Postal Service requirements.

B. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 WARRANTY

A. Manufacturer's standard warranty to repair or replace components of postal specialties that fail in materials or workmanship within five years from date of purchase.

1.6 DELIVERY, STORAGE AND HANDLING

A. Verify field measurements are as indicated on shop drawings.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 – Product Requirements.

1.8 ADDED MATERIALS

A. None.

PART 2 PRODUCTS

2.1 POSTAL EQUIPMENT

A. Listed Manufacturer: Auth Florence Manufacturing Company, Manhattan, Kansas.

B. Other Manufacturers:
   1. American Device Manufacturing Co.
   2. Bommer Industries Inc.
   3. Cutler Manufacturing Co.
   4. Salsbury Industries.

2.2 PRODUCTS

A. Exterior Mail Center: Auth Florence pedestal mounted aluminum mailbox units complying with USPS STD 4C.
   1. Model: Series 4C Front-Load Exterior Depot Cabinet by Auth-Florence.
   2. Module:
      a. Six model 4CADD-10-D. Depot cabinet.
      b. Two model 4CADD-8-D. Depot cabinet.
      c. Provide at minimum one mailbox per residential unit.
   3. Mounting: Pad Mounted.
   4. Locks: USPS-1172 910A, 3 keys each lock.
   5. Box Identification: Architect will determine custom numbering system corresponding to building and residential unit configuration, and ADA reach-range requirements.

B. Finish: powder coated, color selected by Architect from manufacturer's standard line.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify prepared openings are ready to receive work.

C. Verify field measurements are as indicated on shop drawings.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Install in accordance with U.S. Postal Service regulations.

C. Install and secure in position, neatly, and level/plumb.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 10 60 00

INTERIOR AND EXTERIOR SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Supplying and installing closet shelving.
   2. Supplying and installing Knox boxes.
   3. Supplying and installing corner guards.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 05 50 00 - Metal Fabrications.
   2. Section 06 10 00 - Rough Carpentry.
   3. Section 09 21 16 - Gypsum Board Assemblies.
   4. Section 09 90 00 - Painting and Coatings.

1.2 REFERENCES

A. ASTM International:
   1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   3. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
   4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   6. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
   7. ASTM C1036 - Standard Specification for Flat Glass.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittals:
   1. Product Data: Submit data on specialty products describing size, finish, details of function, attachment methods.
   2. Manufacturer's Installation Instructions: Submit special procedures, and conditions requiring special attention.

3. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. 01 40 00 – Quality Requirements.

1.5 WARRANTY

A. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 INTERIOR SPECIALTIES, MANUFACTURERS AND PRODUCTS

A. Manufacturer and/or product model substitutions: Section 01 60 00 - Product Requirements.

B. Closet Shelving: Locations and quantities shown on drawings. Coated steel wire shelving, nominal 12” deep with coat hanger rod under shelf where noted, ClosetMaid or approved equal. Install with hanging horizontal track, vertical standards, brackets, end caps, hold-down clips and other accessories standard with the manufacturer for a complete installation.

C. Stainless Steel Corner Guards: Thirty (30) four foot long 90 degree stainless steel corner guards with 1-1/2” wings. Type 304, 16 gauge with #4 satin finish. Install with construction adhesive meeting requirements of Section 01 81 13.
   1. Corner guards installed in locations in office and common areas indicated by owner after finishes installed but prior to project closeout.

D. Stainless Steel Kick Plates: Twenty (20) stainless steel kick plates. 10” high, 24” wide, 18 gauge with #4 satin finish. Install with truss head screws.
   1. Kick plates installed in locations in office and common areas indicated by owner after finishes installed but prior to project closeout.

2.2 EXTERIOR SPECIALTIES, MANUFACTURERS AND PRODUCTS

A. Manufacturer and/or product model substitutions: Section 01 60 00 - Product Requirements.

B. Knox Box: Two (4) Knox box 3200 Series Hinge Door Model, located adjacent to doors 132a, 133a and driveway gates. Recessed Knox Boxes at doors, surface mounted at gates. Color by Architect from manufacturer’s standard colors. Mount height and location per Yakima Fire Department.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify exact location of products for installation.

C. Verify field measurements are as indicated on product data submittal.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Follow manufacturer's printed instructions, using manufacturer's standard attachment devices and procedures.

C. Adjust all moving parts to operate smoothly.

D. Leave product and adjacent area clean and free of defects.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 11 31 00

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SUMMARY

A. Work includes:
   1. Residential unit, laundry room and break room appliances as shown on drawings, including all required miscellaneous parts and accessory items for complete installations.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Residential refrigerators to be Energy Star labeled per ESDS Criterion 5.03. Residential range hoods to be Energy Star labeled per ESDS Criterion 7.07a. Laundry equipment to be Energy Star labeled per ESDS Criterion 5.04.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 12 35 30 - Residential Casework.
   2. Division 22 and 23 - Mechanical.
   3. Division 26 - Electrical.

1.2 REFERENCES

A. None.

1.3 SUBMITTALS

A. Section 10 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittal:
   1. Setting drawings: Provide setting drawings showing all installation conditions for built-in equipment.
   2. Product data: Submit copies of manufacturer’s product data, installation, and maintenance instructions for each appliance. Transmit extra copies of installation instructions to installer.
   3. Provide templates, instructions, and directions required to insure accurate location of utility rough-in and anchorage devices.
   4. Operation and Maintenance Data per Section 01 70 00: Submit in triplicate manufacturer’s printed directions.
   5. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

C. ESDS Binder Submittal:
   1. Provide manufacturer’s product data showing Energy Star Label for appliances. See specification section 01 81 13-1.6 C 8.

2. Provide manufacturer's product data showing Energy Star Label for range hood. See specification section 01 81 13-1.6 C 17.
3. YHA to provide manufacturer's product data showing Energy Star Label for washers and dryers. See specification section 01 81 13-1.6 C 9.

1.4 QUALITY ASSURANCE

A. 01 40 00 – Quality Requirements.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Fully guarantee each unit against defects in function and appearance (not caused by abuse) for a period of two years minimum (or longer if standard with manufacturer from date of Substantial Completion).
   1. Fully guarantee each commercial washer and dryer against defects in function and appearance for a period of five years minimum.

C. Remove, reinstall new units, transport, furnish parts, labor and any other service or material necessary to correct defective units. All appliances are to be in perfect operating condition.

D. Supplier to be in position to offer service contract after warranty expiration.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Carefully crate and insulate against marring, and other damage in transit.

C. Acceptance at site: Carefully uncrate. Verify units in satisfactory condition.

D. Store out of harm's way. Handle units carefully, prevent marring. Protect units at all times.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Listed Manufacturer: General Electric Appliances, unless otherwise noted.

B. Other Manufacturers offering products which meet requirements are:
   1. Frigidaire; White Consolidated Ind.
   2. Sears (Kenmore).
   3. Whirlpool Home Appliances.

C. Provide all product types from the same Manufacturer for consistency and uniformity.

D. Submittal package shall indicate manufacturer's current model number if different than the model listed.

E. Color: white unless otherwise indicated.

2.2 DWELLING UNIT KITCHEN APPLIANCES

A. Range #1: Free-Standing Electric Range – GE JB625DK – 30” Free Standing Electric Range.
1. Size: 30” wide x 25 3/8” depth x 47” height - confirm with supplier.
2. Top: Lift-up ceramic glass cooktop, surface unit “on” indicator light.
3. Front/Door: Window.
4. Oven: Porcelain enamel on steel with 2 stainless steel oven racks, and interior light.
5. Misc. Broiler pan/rack, bottom storage drawer, cord and plug.
6. Finish: White.
7. Location: all units except “Type A” Accessible Units.

B. Range #2: Free-Standing Electric Range – GE JB480DM – 30” Free Standing Electric Range.
1. Size: 29-7/8” wide x 26-1/4” depth x 47” height - confirm with supplier.
2. Top: Lift-up ceramic glass cooktop, surface unit “on” indicator light.
3. Front/Door: Window.
4. Oven: Porcelain enamel on steel with 2 stainless steel oven racks, and interior light.
5. Misc. Broiler pan/rack, bottom storage drawer, cord and plug.
6. Finish: White.
7. Location: all “Type A” Accessible Units, room 130 and room 111.

C. Refrigerator #1: Refrigerator/Freezer - GE Energy Star 17.5 Cu. Ft. Top-Freezer Refrigerator, Model GTE18DCN.
1. Frostless top-freezer refrigerator.
2. Size: 28” wide x 30-1/2” deep x 66-7/8” high - confirm with supplier.
3. Capacity: 17.5 Cu. Ft.
4. Features: Plastic interior liner, 4 adjustable wire shelves, 1 freezer shelf, reversible door.
5. No automatic icemaker. No water filtration or water.
6. Energy Star rated.
7. Finish: White.
8. Location: all units except “Type A” Accessible Units.

D. Refrigerator #2: Refrigerator/Freezer - GE Energy Star 23.0 Cu. Ft. Top-Freezer Refrigerator, Model GSE23GGPWW.
1. Frostless side-freezer refrigerator.
2. Size: 32-3/4” wide x 34-3/4” deep x 69-5/8” high - confirm with supplier.
3. Capacity: 23 Cu. Ft.
4. Features: Plastic interior liner, 4 adjustable wire shelves, 1 freezer shelf, reversible door.
5. No automatic icemaker. No water filtration or water.
6. Energy Star rated.
7. ADA Compliant.
8. Finish: White.
9. Location: all “Type A” Accessible Units, room 130 and room 111.

E. Range Hood #1: Range Hood – GE JVX5305DJ 30” Under Cabinet Hood.
1. Externally ventilated. Vertical exhaust.
2. 30” width matches range.
3. Cooktop Light.
4. Exhaust capacity for horizontal discharge, 270 CFM, 4.5 sones.

5. Built-in damper at duct connector.
6. Two-speed fan control switch.
7. Light and fan switch to be modified with cover plate riveted to fan face to lock light switch to on position and fan switch to high to always come on with range timer/switch is activated per electrical drawings (all units).
8. Energy Star rated.
9. Finish: White
10. Location: All units.

2.3 COMMON LAUNDRY ROOMS

A. Washers and Dryers to be furnished by YHA and installed by contractor.
   1. Contractor to provide power, water and ventilation (including ducted dryer exhaust) connections for Washer and Dryers in rooms 110, 219, 319 and 419.
   2. YHA to provide and Contractor to install coin machine in laundry room 110.
   3. YHA to provide contractor with requirements for washer and dryers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to all work of this section, carefully inspect work of all other trades and verify conditions as complete and satisfactory for appliance installation.

B. Verify that equipment may be installed in accordance with original design and manufacturer's recommendations.

C. Discrepancies: In the event of discrepancy, immediately notify Architect. Do not proceed until all discrepancies have been fully resolved.

3.2 INSTALLATION

A. Install in accordance with all referenced regulation requirements and manufacturer's directions.

B. Deliver self-supporting units to room.

C. Set in location indicated, level, and properly align with casework and other fixtures. Coordinate delivery with VCT installation – complete VCT waxing before appliances are delivered.

D. Secure as necessary.

E. Check operation. Appliances are to be in perfect operating condition. Remove all packing, paper wrapping, etc. prior to operating each appliance.

F. Arrange for and coordinate electrical and mechanical connections as applicable.

3.3 FIELD QUALITY CONTROL

A. Conduct inspection and tests of equipment in presence of Architect.

B. Remove, transport, reinstall, furnish parts, labor and any other service or material necessary to replace defective units.

3.4 ADJUSTMENTS AND CLEANING

A. Adjust unit as required for proper operation.

B. Leave installations clean; premises free from residue of work of this section.

3.5 PROTECTION OF INSTALLED WORK

A. Protect installed units against damage and deterioration during remainder of construction period.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 12 20 00

WINDOW TREATMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Horizontal Vinyl blinds for residential rooms.
   2. All required miscellaneous parts and accessory items for complete installations.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None.

D. Related Sections:
   1. Section 08 41 12 - Aluminum-Framed Entrances and Storefronts.
   2. Section 08 53 00 - Plastic (PVC) Windows.

1.2 REFERENCES

A. None.

1.3 SUBMITTALS

A. Section 10 33 00 - Submittal Procedures: Submittal procedures.

B. Action Submittal:
   1. Shop drawings: Provide shop drawings showing all installation details, dimensions, fastenings and accessories.
   2. Product data: Submit copies of manufacturer’s product data, performance data, installation, and maintenance instructions. Provide color chart or fabric samples as required for Architect's selection/confirmation of fabrics and colors.
   3. Operation and Maintenance Data per Section 01 70 00: Submit in triplicate manufacturer’s printed directions.
   4. Product Data: For installation adhesives and sealants provide printed statement of VOC content. VOC content will be reviewed for compliance with Section 01 81 13.

1.4 QUALITY ASSURANCE

A. Section 00 73 13 - Supplementary Conditions: Installer to be "specialist" as defined therein, and acceptable to product manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Deliver in protective wrappings.

C. Acceptance at site: Carefully unwrap. Verify units in satisfactory condition.

D. Store out of harm's way. Handle units carefully, prevent marring. Protect units at all times.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.1 HORIZONTAL VINYL BLINDS (MINI-BLINDS)

A. Listed Manufacturer: A&I Manufacturing.
   1. Also accepted: Bali, Levelor, Lorentzen.

B. Style: A&I Manufacturing 2" Designer Vinyl, 2" horizontal mini-blinds, vinyl slats.

C. Operation: Pull cord to raise and lower slats; cord operated tilt control mechanism; pull cords to be supplied with "break-away" safety feature at bottom knot cover.

D. Other Components:
   1. 0.025 thick "U" shaped steel head channel, installation brackets with end caps, and steel bottom rail.
   2. Pull cord and polyester braided ladders to support slats.
   3. Deluxe 2" slat valance.
   4. Color: Selected by Architect from manufacturer's full color line. All blinds shall be of one color. Head, bottom rails, cords, and braided ladder shall be color-coordinated to selection.
   5. Sizes shall be as recommended by manufacturer for condition of installation, and based on field- measured openings. Size so that bottom rail rests 1/2" above windowsill when in lowered position, and edge of blinds are 1/2" clear of window liners. Field measure to confirm opening size prior to fabricating blinds.
   6. Fasteners, shims and the like as standard with the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 INSTALLATION, POSITION

A. In general, strictly comply with manufacturer's printed installation instructions.

B. Set in location indicated, level, and properly aligned to operate freely. Secure as necessary.

3.3 ADJUSTMENTS AND CLEANING

A. Check operation. Adjust unit as required for proper operation.

B. Leave installations clean, and premises free from residue of work of this section.

3.4 PROTECTION OF INSTALLED WORK

A. Protect installed units against damage and deterioration during remainder of construction period.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

3.6 SCHEDULE OF LOCATIONS

A. Horizontal Vinyl Blinds:
   1. All exterior residential unit windows.

END OF SECTION

SECTION 12 35 30

RESIDENTIAL CASEWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Residential cabinets and cabinet hardware in residential units.
   2. Cabinets and cabinet hardware in common and YHA office spaces.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Engineered wood to contain no added urea formaldehyde and must be certified compliant to CA 92120 Phase 2 per ESDS 6.1a.

C. Project Specific Requirements:
   1. Type A accessible unit sink base cabinets to have no kick, bottom deck or doors.
   2. Type B unit sink base cabinets to have removable kick, bottom deck and doors.
   3. Common space sink base cabinets to have no kick, bottom deck or doors.
   4. All sink base cabinets in all units and common spaces to have a pipe protection panel where possible.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 06 20 00 - Finish Carpentry.
   3. Section 06 61 16 – Solid Surface Countertops.
   4. Section 09 65 16 – Resilient Sheet Flooring (sink base ‘floor’).

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A156.9 - Cabinet Hardware.
   2. ANSI A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets.

B. Kitchen Cabinet Manufacturers Association: KCMA - Directory of Certified Cabinet Manufacturers.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Action Submittals:
   1. Shop Drawings: Indicate casework locations, scale plans, elevations, rough-in and anchor placement dimensions and tolerances, and clearances required. Provide drawings based on as-built room dimensions, and indicate any filler panel location and sizes required.
   2. Product Data: Submit component dimensions, configurations, construction details, joint details, and standard hardware.

3. Finish Samples: Submit four samples, minimum size 3 x 6 inches of each color of finish.
4. Hardware Samples: Submit four samples of door/drawer pull hardware for finish color approval.

C. ESDS Binder:
1. Certification: All composite wood products exposed to interior must have no added urea formaldehyde and be certified compliant to CA 92120 Phase 2. See 01 81 13 – 1.6 C 12.
2. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A161.1 and KCMA certification.

B. Qualifications:
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 EXTRA MATERIALS

A. Cabinet shelf clips: provide 100 extra clips for Owner’s maintenance/replacement.

PART 2 PRODUCTS

2.1 CASEWORK

A. Listed Manufacturer: SMART Cabinets.

B. Other Manufacturers:
1. Lanz Cabinets, Eugene, OR
2. Tacoma Fixture Co., Tacoma, WA.
3. Cabinets Northwest Corp., Auburn, WA.
4. Substitutions: Section 01 60 00 - Product Requirements.

2.2 RESIDENTIAL CASEWORK COMPONENTS

A. Style: SMART Cabinets, Squire. Shaker Mortise and Tenon Door, Veneer Flat Panel, Solid Drawer front.

B. Finish Material: Northern Red Oak
   1. Finished Surfaces: All exposed ends and sides shall have matching material and finish.
   2. Cabinets with adjacent removable cabinets or self-supporting appliances shall have an adjacent finished side to allow for removal.
   3. Ultra low VOC water-based spray stain and water-based high performance UV cured top coat finish.

C. Cabinet Box: 5/8” formaldehyde-free plywood. Laminate interior.

D. Face Frames: 3/4" solid hardwood, glued and screw doweled.

E. Sink Base Cabinets:
   1. Type A Accessible Units (ADA Units): No toe kick, doors or bottom deck. See 7/G064 and 10/G064.
      a. Include pipe protection panel. Panel to be plam per 06 61 00. Install in front of supply and drain pipes as indicated on drawings. Panel to span between base cabinet end panels.
   2. Type B Units: Include removable toe kick, doors and bottom deck where required per 3/G062.

F. Counter Top: Refer to Section 06 61 16 – Solid Surface Fabrications.

G. Door and Drawer Fronts: Solid hardwood drawer front, solid hardwood door stile and rail with flat panel.

H. Shelves: 5/8” plywood, urea-formaldehyde free, with white melamine laminate, edges banded with PVC edge, full depth adjustable by the use of plastic shelf clips.

I. Drawer box: Sides from 1/2" plywood, bottom from ¼” plywood, urea-formaldehyde free, with white melamine surfacing.

J. Bolts, Nuts, Washers and Screws: Manufacturer's standard.

K. Door pulls: Bar Pull, SS finish.

L. All composite wood must be certified as compliant with California 93120 Phase 2 per 01 81 13 – 2.2 C.

2.3 COMMON ROOM CASEWORK COMPONENTS

A. Style: SMART Cabinets, Squire. Shaker Mortise and Tenon Door, Veneer Flat Panel, Solid Drawer front.

B. Finish Material: Chosen by architect from manufacturer’s standard colors.
   1. Finished Surfaces: All exposed ends and sides shall have matching material and finish.
   2. Cabinets with adjacent removable cabinets or self-supporting appliances shall have an adjacent finished side to allow for removal.
   3. Ultra low VOC water-based spray stain and water-based high performance UV cured top coat finish.

C. Cabinet Box: 5/8” formaldehyde-free plywood. Laminate interior.

D. Face Frames: 3/4" solid hardwood, glued and screw doweled.

E. Sink Base Cabinets:
   1. Common Rooms: No toe kick, doors or bottom deck. See 7/G064 and 10/G064.
   2. Include pipe protection panel. Panel to be plam per 06 61 00. Install in front of supply and drain pipes as indicated on drawings. Panel to span between base cabinet end panels.

F. Counter Top: Refer to Section 06 61 16 – Solid Surface Fabrications.

G. Door and Drawer Fronts: Solid hardwood drawer front, solid hardwood door stile and rail with flat panel.

H. Shelves: 5/8” plywood, urea-formaldehyde free, with white melamine laminate, edges banded with PVC edge, full depth adjustable by the use of plastic shelf clips.

I. Drawer box: Sides from 1/2" plywood, bottom from ¼” plywood, urea-formaldehyde free, with white melamine surfacing.

J. Bolts, Nuts, Washers and Screws: Manufacturer's standard.

K. Door pulls: Bar Pull, SS finish.

L. All composite wood must be certified as compliant with California 93120 Phase 2 per 01 81 13 – 2.2 C.

2.4 HARDWARE COMPONENTS

A. Hardware: Manufacturer's standard.

B. Drawer and Door Pulls: Loop-type ("wire") pulls, brushed stainless steel, blind screwed from the interior side of the door/drawer.

C. Drawer Slides: Full extension ball bearing side-mount with 100 lb. rating.

D. Hinges: Salice concealed clip 110-degree self-closing hinge, adjustable, manufacturer's standard chrome finish.

E. Door Bumpers: Resilient plastic with adhesive back; clear color; 5/16” diameter x 3/64”.

2.5 FABRICATION

A. Shop-assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.

C. Fabricate each unit rigid, not dependent on building structure adjacent units for rigidity.

D. Form edges smooth. Form material for counter tops from continuous sheets.

E. Provide cutouts for plumbing fixtures and appliances. Prime paint contact surfaces of cut edges.

F. When necessary to cut and fit on site, furnish materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

G. Coordinate cabinet fabrication and installation to accommodate size and location of residential appliances as shown on Drawings. See Section 11 31 00.

2.6 SHOP FINISHING

A. Exposed To View Surfaces: finish as noted in 2.2-B above.

B. Interior Surfaces: manufacturer's standard melamine surfacing.

2.7 CASEWORK LOCATIONS

A. Apartment Unit Kitchens

B. Apartment Unit Bathrooms

C. Other Locations:
   1. Community Room (111)
   2. Mother’s Room (122)
   3. Staff Kitchen (130)

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify adequacy of support framing.

3.2 INSTALLATION

A. Install casework, components and accessories. In general, strictly comply with manufacturer's printed installation instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Use filler strips; not additional overlay trim for this purpose.

E. Close ends of units, back splashes, shelves and bases. Joints between units to be tight and flush.

F. Sealants: Refer to Section 07 90 00 for type. Apply continuous bead of clear sealant at top of countertop splash-to-wall.

3.3 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean casework, counters, shelves, and hardware.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit finished casework to be exposed to continued construction activity.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS

PART 1 1. GENERAL

1.1 SUMMARY

A. Section includes: Installation of new site benches.

B. Scope of work: The work shall consist of installation of all materials necessary for site benches to be installed and secured in-place per manufacturer's instructions.

C. Coordinate work of this section with civil, mechanical and electrical contractors.

D. Confirm location of irrigation water source. Refer to civil utility record drawing plans for water source locations.

E. Prepare design/build drawings for review by Owner's Representative.

F. Prepare and provide construction records and equipment catalog information.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
1. Section 03 05 15 – Portland Cement
2. Section 32 90 90 – Planting

1.3 SUBMITTALS

A. Product Data: Contractor shall furnish catalog cuts or other descriptive literature, including current manufacturer's price lists, of all specified equipment and materials for approval by the Owner's Representative prior to installation. Equipment or materials installed or furnished without prior approval of the Owner's Representative will be rejected and such materials will be required to be removed and replaced with approved materials at the complete expense of the Contractor.

1.4 QUALITY ASSURANCE

A. All products supplied will comply with applicable state and local codes.

PART 2 PRODUCTS

2.1 BENCHES

A. Harpo bench 69”. Backed with arm rests. Aluminum slats. By Landscape Forms.(800) 430-6209. Embedded per manufacturer’s instructions.

END OF SECTION

SECTION 13 35 30

TRANSACTION WINDOW

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Aluminum framed transaction window with bullet resistant glass.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for general requirements.
   2. Assembly to be Bullet Resistant Level 3.

C. Project Specific Requirements:
   1. None.

D. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 06 20 00 - Finish Carpentry.
   3. Section 06 61 16 – Solid Surface Countertops.

1.2 REFERENCES

A. Underwriters Laboratory:
   1. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment

B. National Institute of Justice:
   1. NIJ Standard 0108.01 Standard for Ballistic Resistant Protective Materials

C. American Society for Testing and Materials:
   1. ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
   2. ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Action Submittals:
   1. Product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location.
   2. Shop drawings
   3. Test reports: current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories
   4. Manufacturer’s Instructions for installation and cleaning of TSS Bullet Transaction Window Assemblies. All required submittals shall be approved prior to installation..
   5. VOC Content: Provide printed statement of VOC content for products, installation adhesives and site-applied paints and sealants. VOC content will be reviewed for compliance with Section 01 81 13 – 2.2 A and B.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years' experience.
   2. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Standard one year warranty on products and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Handle the materials with care to prevent damage.

C. Store materials inside and under cover, stack flat and off floor.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Listed Manufacturer: Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 800-513-1468.

B. Other Manufacturers:
   1. Ready Access, West Chicago, IL
   2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 BULLET RESISTANT TRANSACTION WINDOW

A. TSS Hole and Backer Transaction Window:
   1. Custom prefabricated bullet resistant panels with secure air passage as required for voice transmission.
   2. Aluminum frame, with a plastic laminate base and cash tray. All accessories for installation are included.
   3. Finish: clear anodized.

B. Glazing Panels shall be Bullet Resistant Level 3, 1-1/4" Laminated as shown on the drawings.

C. Cash Tray: Brushed Stainless Steel Recess Mounted.

D. Aluminum sections:

1. To be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place.
2. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment

2.3 BULLET RESISTANT FRAMES AND GLAZING

A. TSS BL1.75 Ballistic Framing:
1. Custom prefabricated aluminum frame designed to accept bullet resistant glazing materials.
2. Aluminum frame, size as shown on window schedule A610.
3. Finish: clear anodized.

B. Glazing Panels shall be Bullet Resistant Level 3, 1-1/4” Laminated as shown on the drawings.

C. Aluminum sections:
1. To be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place.
2. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

C. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.2 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings.

B. Install in accordance with manufacturer’s instructions and UL 752.

C. Set all equipment plumb.

D. All products shall be installed per installation instructions provided Manufacturer.

E. Transaction Window: shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure.

3.3 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.4 LOCATIONS

A. Reception (115)

B. Client Meeting Room (125)

C. Client Meeting Room (128)

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit finished window to be exposed to continued construction activity.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION

SECTION 14 21 23

ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Gearless electric traction passenger elevator, as noted on drawings.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control system.
4. Accessibility provisions for physically disabled persons.
5. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
6. Materials and accessories as required to complete installation.

B. Performance Requirements:
1. The Owner has established environmental goals for this project. Refer to Section 01 81 15 for general requirements.
2. Conform to referenced Building Code, Fire Code and jurisdictional requirements for installation of elevator system.
3. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for purpose specified and indicated.

C. Project Specific Requirements:
1. All controls to be vandal resistant.
2. Provide travelling cable and security camera for elevator cabs.

D. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.
2. Section 05 50 00 - Metal Fabrications.
3. Section 07 17 00 - Bentonite Waterproofing.
4. Section 08 31 13 - Access Doors.
5. Section 08 71 00 - Door Hardware: Product requirements for key cylinders and/or card readers for placement by this section.
6. Section 09 21 16 - Gypsum Board Assemblies.
7. Section 09 65 00 - Resilient Flooring.
8. Section 10 44 00 - Fire Protection Specialties.
9. Division 21 - Fire Suppression: Sprinkler heads in hoistway.
10. Division 22 - Plumbing: Pit drain, sump and pump.
11. Division 23 - HVAC: Mechanical fan for pressurization of elevator hoistway, ventilation and temperature control of elevator equipment room.
12. Division 26 - Electrical:
    a. Empty conduit to elevator equipment devices remote from elevator machine room or hoistway.
    b. Empty conduit between controller cabinet to remote group supervisory panel.
    c. Electrical service for convenience outlets, pit, and lighting.
    d. Electrical characteristics and wiring connections.

e. Electrical service to main disconnect in elevator machine room including emergency power transfer cabinet and electrical power for elevator installation and testing.

13. Division 27 - Communications
14. Division 28 - Electronic Safety and Security:
    a. Electrical disconnecting device to elevator equipment prior to activation of sprinkler system.
    b. Empty conduit for telephone service.
    c. Fire and smoke detectors and interconnecting devices.
    d. Fire alarm signal lines to elevator controller cabinet.
    e. Access Controls.
    f. Closed Circuit TV.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME A17.1 - Safety Code for Elevators and Escalators, latest edition or as required by local code.
   2. ASME A17.2.2 - Inspector's Manual for Hydraulic Elevators.

B. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A139 - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over).
   3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   5. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   6. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. American Welding Society: AWS D1.1 - Structural Welding Code - Steel.

D. National Electrical Manufacturers Association:
   1. NEMA LD 3 - High Pressure Decorative Laminates.
   2. NEMA MG 1 - Motors and Generators.

E. National Fire Protection Association:
   1. NFPA 80 - Standard for Fire Doors, Fire Windows.
   2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
   3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. Underwriters Laboratories Inc.:
   1. UL 10B - Fire Tests of Door Assemblies.
   2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Action Submittals:
   1. Shop Drawings:
      a. Show equipment arrangement in the control closet, corridor, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
      b. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
      c. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
      d. Indicate electrical power requirements and branch circuit protection device recommendations.
   2. Powder Coat Paint Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
   3. Plastic Laminate Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
   4. Metal Finishes: Upon request, standard metal samples provided.

C. CLOSEOUT SUBMITTALS
   1. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
   2. Operation and Maintenance Data:
      a. Include parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
      b. Include technical information for servicing operating equipment.
      c. Include legible schematic of hydraulic piping and wiring diagrams of installed electrical equipment and changes made in the Work. List symbols corresponding to identity or markings on machine room and hoistway apparatus.
      d. Include one copy of master electric and hydraulic schematic and one copy of lubrication chart.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASME A17.1, Safety Code for Elevators and Escalators, latest edition or as required by local building code.

B. Fire Rated Door Construction: Conform to NFPA 80.

C. Attach fire rating label from agency approved by authority having jurisdiction to identify each fire rated door.

D. Inspection and Testing: Elevator installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.

E. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   2. Installer: Company specializing in performing Work of this section and approved by elevator equipment manufacturer.

F. PRE-INSTALLATION MEETINGS
   1. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
   2. Convene minimum one week prior to commencing work of this section.
   3. Require attendance of persons directly involved with Work of this section.

4. Review schedule of installation, installation procedures and conditions, and coordination with related Work.
5. Review temporary use of elevator for construction purposes, hours of use, scheduling of its use, cleanliness of cab, employment of operator, maintenance of system.

1.5 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five-year manufacturer warranty for elevator equipment and devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements.

B. Temporary Use:
1. Provide all necessary protection to prevent damage to each elevator used for construction purposes before Substantial Completion.
2. Provide temporary enclosures, coverings, guards, barriers and other devices required to protect the elevator car enclosures, hoistway entrances, signal fixtures and related materials, components and finishes from damage. Protective materials, methods and procedures shall be approved by the elevator manufacturer and paid for by the user.
3. Elevators shall be free of damage or deterioration at time of Substantial Completion. Cost to repair damaged materials and finishes and replace worn or defective components to restore elevators to their original condition shall be paid by the user.

C. Tools:
1. Any special tools, devices, software or equipment required for monitoring the wear of any means of suspension other than standard elevator steel cables shall be included with the installation of the equipment and become the property of the owner at time of elevator completion. This includes special ongoing monitoring systems, special tools and instruction needed to monitor the suspension system.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

1.8 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements: Maintenance service.

B. Furnish maintenance and call back service for a period of 12 months after substantial completion.
1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
2. Manufacturer shall have a service office and full-time service personnel within a 100 mile radius of the project site.

C. Provide a separate proposal for the Owner's acceptance to furnish service and maintenance for the elevator systems and components for a time period of ten years, with the Architect's date of Substantial Completion. The agreement will be the Manufacturer’s standard “Platinum Coverage.” Owner may modify the conditions listed below prior to accepting this proposal.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Design based on ThyssenKrupp Elevator’s Endura 3500 Self-Supported Machine Room-Less elevator.

2.2 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350.

B. Colors, Patterns, and Finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

C. Steel:
   1. Shapes and Bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture’s standard selections.

D. Plastic Laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

E. Provide Wall Protection Pads.

F. Flooring: By others.

2.3 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Dry, non-lubricated steel, fastened to the building with steel brackets.

D. Guides: Guide shoes or roller guides with a minimum of three tires shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.

E. Deflector Sheaves: None.

F. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by the project conditions.

G. Machine: The hoisting machine shall be a compact energy efficient permanent magnet Gearless traction type, consisting of PMAC motor, brake and driving sheave mounted on a rigid bedplate in the top of the hoistway. A large solid, forged shaft shall serve as a support for the motor rotor assembly and for the drive sheave and break system. It shall be supported by roller bearings mounted in the machine housing.

H. Drive System:
1. The drive system shall be of the Variable Voltage Variable Frequency (VVVF) Regenerative.
2. The system shall be a vector-controlled pulse-width modulated AC drive. The variable voltage variable frequency drive shall convert the AC power supply using a two-step process to a variable voltage variable frequency power supply for use by the hoist motor.
3. The speed control shall be by means of vector control providing direct torque current and field excitation is automatically provided by permanent magnet. A digital absolute velocity encoder shall be provided giving feedback to the controller on armature position and motor speed.

I. Motor/Machine: The motor shall be permanent magnet AC, totally enclosed, non-ventilated with class "F" insulation. The motor rotor assembly shall be dynamically balanced and supported by roller bearings of ample capacity. The armature and driving sheave shall be properly balanced for smooth, high-speed elevator performance. The PM machine shall be mounted horizontally in the top of the hoistway inn a unitized formed steel structure on bearing plates furnished by the elevator installer. The unitized formed steel structure shall be securely fastened to the supports supplied by other trades.

J. Brake: The brake shall be a spring applied electric brake; held open by an electro-magnet actuated by a digital brake controller and designed to make smooth, positive stops. The Brake shall be designed to automatically apply in the event of interruption of power supply from any cause. Operation and control of the brake shall be all digital. The setting and lifting of the brake shall be software based and all electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be used in the actuation of the brake.

K. Suspension Belts and Governor Rope: Suspension belts shall be flat belts of polyurethane with an inner core of 14 steel cores with an FT1 fire rating. Each belt shall have a suspension strength of 60 KN (13,488 pounds).
1. Four to six belts shall be used depending on the car capacity.
2. Suspension tension monitor shall detect differences in belt tension and for loss of tension. If fault is detected, the car shall stop at the nearest floor and an Out of Service call be registered.
3. Governor ropes shall be of iron construction.

L. Counterweight: Counterbalance each elevator for smooth and economical operation by using iron or steel plate weights securely fastened in a steel counterweight frame. Counterweight shall equal the weight of the complete elevator car and approximately 50 percent of the specified capacity load.

M. Safety and Governor: Car safety shall be mounted on the bottom members of the car frame and be operated by a centrifugal speed governor. The governor shall be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. The governor shall function when the car over speeds.

N. Emergency Terminal Limits: Place electric limit devices in the hoistway near the terminal landings. Limit switch(es) shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

O. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load

P. Traveling cable for Closed Circuit TV and access controls.

2.4 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
   2. Main Landing Door & Frame Finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
   3. Typical Door & Frame Finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two-point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.5 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. Walls:
      a. Wall Panels: Shall be finished on both sides with high pressure plastic laminate.
      b. Reveals and Frieze: Powder Coated
   2. Canopy: Cold-rolled steel with hinged exit.
   3. Ceiling: Downlight type, metal pans with suspended LED downlights. Number of downlights shall be dependent on platform size with a

minimum of six. The metal pans shall be finished with a stainless steel, no. 4 brushed finish.

4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel.
5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels, No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.
6. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
7. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.

B. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.6 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
   3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse, and the door will reopen to answer the other call.
   4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
   5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen partially. After the obstruction is cleared, the doors shall begin to close.
   6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.

7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infrared light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.7 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel: Not Required.

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment: Not Applicable.

2.8 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. The system shall operate in real time, continuously analyzing the car(s) changing position, condition, and work load. All controller and operational circuits including the brake control and drive system shall be digital. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floor served, for registering car stops, and by “up-down” push buttons at each intermediate landing and “call” push buttons at terminal landings.
1. Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.
2. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction

shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.

3. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically, and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.
4. A car that is stopping for the last hall call in the preference direction and that hall call is for the opposite direction with no onward car calls, shall reverse preference when the selector position advances to the landing at which the car is committed to stop. A car that is stopping for the last hall call in the preference direction, and that hall call is for the same direction, shall hold its preference until the door is almost closed allowing time for a passenger to register an onward car call which will maintain the preference. If no car call is registered before the door is almost closed, the car will lose its preference and shall be available to accept calls in either direction.

B. Operation: Selective Collective – ETA based. The system is optimized to get a car to the floor where a hall call has been registered, in the shortest time. The system receives input information from standard call pushbuttons located in the hall, car position and car load information from individual car loadweighers.

C. Load Weighing Device: Provide a load weighing device on each car which, when the particular car is filled to an adjustable percentage of the capacity load, shall cause the car to bypass landing calls but not car calls. The passed landing calls shall remain registered for the next following car.

1. The device shall be unaffected by the action of compensating chain or rope. The device shall detect a 50 pound (23 Kg.) load change under all conditions.
2. The load sensor shall use a load cell to accurately measure the weight in the car. The information shall be transferred via a serial link to the elevator controller.

D. Anti-Nuisance Call Control: The microprocessor control system shall evaluate the number of people on the car and compare that value to the number of car calls registered. If the number of car calls exceeds the number of people by a field programmable value, the car calls shall be canceled after the first call has been answered.

E. Position Selector: The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slow down points in memory.

F. Motion Control: The drive control system shall be dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.

G. Motor Pre-Torque: Current shall be applied to the elevator drive before the brake is released and the speed pattern is dictated to eliminate roll back and sling shot effects of unbalanced loads in the car. The electronic loadweigher shall determine the load on the car determining a pre-torque reference to send to the drive.

H. Emergency Power Operation: (Group 10-D4A) Upon loss of normal power, building-supplied standby power is available to the elevator on the same wires as the normal power. Once the loss of normal power has been detected and standby power is available, one elevator at a time from each group will be lowered to a pre-designated landing and will open the doors. After passengers have exited the elevator, the doors are closed and the car shuts down. The next available car in the group will then be selected to lower, allow passengers to exit, close the doors and shutdown. This process is repeated until all cars in the group have been lowered and parked. At this time, an elevator is automatically allowed to continue service using the building-supplied standby power. A manual selection switch is available to override the automatic selection and allow and car in the group to provide service to the building. When normal power is restored, the elevators automatically resume operation.

I. Destination Dispatch: Not Applicable.

J. Automatic Light and Fan Shut Down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

K. Special Operation: Not Applicable.

L. Coordinate controller with Access Controls.

2.9 HALL STATIONS

A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of vandal-resistant pushbutton risers with faceplates having a brushed stainless-steel finish. All fixtures shall be vandal resistant type.
   1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
      a. Phase 1 firefighter’s service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at main landing only.

D. Hall lanterns: Not Applicable.

E. Special Equipment: Not Applicable.

2.10 CONTROLLER CLOSET

A. A controller closet shall be provided adjacent to the hoistway at the roof penthouse.
   1. The controller closet for two-car group operation shall be 8’-0” x 5’-6” x 7’-6” high minimum.
   2. The controller closet shall have a 3’-0” wide door minimum.

B. A disconnect shall be provided for each elevator in the controller closet by others.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, including ropes, as recommended by the manufacturer.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

A. Elevator Qty. 1
1. Elevator Model: evolution 200
2. Elevator Type: Gearless Traction Machine Room-Less, Passenger
3. Rated Capacity: 3500 lbs.
4. Rated Speed: 200 ft/min.
5. Operation System: TAC32T
6. Travel: 33'-2"
7. Landings: 4 total
8. Openings:
   a. Front: 4
   b. Rear: 0
9. Clear Car Inside: 6' - 8" wide x 5' – 5" deep
10. Inside Clear Height: 7'-4" standard
11. Door Clear Height: 7’-0” standard
12. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
13. Door Type: Single Speed
14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
15. Seismic Requirements: Zone 3+
16. Hoistway Dimensions: 8' - 4" wide x 6' – 11" deep
17. Pit Depth: 5' - 0"
18. Button & Fixture Style: Vandal Resistant Signal Fixtures
19. Special Operations: None

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Refer to Section 01 50 00 for specific requirements.

END OF SECTION

SECTION 21 00 10

GENERAL FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, and Division 01.

B. This section of the specification applies to the entire mechanical work, both interior and exterior, as specified herein after and shown on the plans.

C. This Contractor is responsible for coordination with all other trades.

1.2 SCOPE

A. All services to within five (5) feet of the building, shall be provided as shown on plans, and final connections to these services shall be made by the Mechanical Contractor.

1.3 DEFINITIONS

A. The term "approved equal" means final approval by the Owner's representative of a material or piece of equipment substituted for that which is shown in the specifications or plans.

B. The term "provide" means the furnishing and installing of equipment (including connections and appurtenances) complete and ready for use.

C. The terms "Mechanical Contractor (MC)" and "Electrical Contractor (EC)" as used in these Specifications or on the Contract Drawings, refers to those subcontractors working under the direction of the "General Contractor (GC)."

1.4 INTENT OF DRAWINGS

A. The drawings are diagrammatic and do not show the exact details and locations, nor all offsets in piping. Contractor shall provide additional fittings, offsets and extensions in piping and related mechanical insulation as required to meet the intent of the documents, and shall include these items in his bid. Contractor shall also include in his bid provisions to relocate or shift piping where conflicts exist with Structural, Architectural, or Electrical components.

B. Refer to the complete set of Architectural, Structural, Electrical, and Civil Plans and Specifications for additional details of the work. Review Plans and Specifications of other trades to identify other requirements. Discrepancies shall be reported to the Owner's representative immediately before ordering material or beginning work.

1.5 COORDINATION

A. Examine the complete set of drawings including all disciplines before work is started. Consult with each of the other Contractors regarding locations and spaces required for work and lay out work to avoid interference. Maximum clearance shall be maintained for service access and maintenance of all

equipment. Failure to coordinate shall be justification to require Contractor, at his own expense, to move his work to provide the necessary space for the other contractors.

B. Mechanical systems have space priority as follows, listed with highest priority first: Graded Drainage Piping, then Ductwork, Drainage Vents, Domestic Water Piping, and Fire Protection Piping. MC to make certain that priority access is maintained. This shall be coordinated by the GC and MC without assistance from Owner's representative, Engineer, or Architect.

C. Contractor shall be responsible for his own coordination between all other trades. Development of Shop Drawings shall be a collaborative effort between the General Contractor, Mechanical Contractor, Electrical Contractor and all other subcontractors working on the project. Shifting of piping, ductwork and other mechanical items shall be the responsibility of the Team to maintain the intent of the documents. Submit shop drawings to the Owner's representative.

1.6 WORK IN OTHER SECTIONS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.7 CODES AND REFERENCES

A. Codes and Standards listed shall be the most current issue as adopted by the Local Jurisdiction. In the event of a conflict of codes, the most stringent code will apply.
   1. International Building Code (IBC)
   2. Uniform Plumbing Code (UPC)
   3. International Mechanical Code (IMC)
   4. Washington State Energy Code
   5. SMACNA Duct Construction Standards, Metal and Flexible
   6. National Electrical Code (NEC)

1.8 PERMITS AND FEES

A. Obtain and pay for all permits, licenses and construction or utility fees. Furnish final certificate to Owner showing compliance with code requirements.

1.9 SCHEDULING

A. Comply with requirements of General Specifications.

1.10 PRIOR APPROVALS

A. Specifications have been written around equipment and material selected for this project based on quality, size, capacity, and performance required to meet building design criteria. Any equipment and/or material used in this project that is not as specified, must have prior approval from the Owner's representative.

B. Request for Approval must be submitted with substitution request form included in Division 0 to Owner's representative a minimum of 10 calendar days prior to bid date. This letter shall be accompanied with complete information regarding items to be substituted. If supplier requires a reply to the request for approval, he is to send a self-addressed, stamped envelope with request.

C. Those items that receive prior approval will be listed in the Mechanical Addenda.

D. Supplier and/or Mechanical Contractor shall be responsible for ensuring that substituted material or equipment is of the same size, quality, capacity, weight, and electrical characteristics as that specified. Any changes and costs required during construction, due to contractor's/supplier's neglect to properly select substituted equipment, shall be paid by the contractor/supplier.

E. Prior approval to bid does not mean automatic final approval of material or equipment by the Owner's representative. Final approval will be given after final submittal data has been presented to Owner's representative, with complete information regarding weights, capacities, size, electrical requirements and quality.

1.11 MATERIAL AND MATERIAL SUBMITTALS

A. All material used on the project shall be new material and free from defects. This Contractor shall submit catalog data and engineering data on all equipment as specified or having received prior approval.

B. Material and equipment specified is designated by various manufacturer's catalog numbers. Acceptable alternate manufacturers are also listed. Such manufacturers are exempt from the 10-day prior approval clause of these specifications, but must submit standard submittal data for final approval as otherwise noted.

C. Submittal shall be arranged in numerical order, according to specification section number and item number. Submittal shall be in PDF format complete with labeled bookmarks (minimum one per specification section)

D. Submittal shall be as follows: Before ordering or installing any of the materials, this Contractor shall submit copies of complete information on the materials to be used on the project. Submittal shall include, but not be limited to, the following.
   1. Contractor's Cost Breakdown.
   2. Complete List of Subcontractors and Suppliers.
   3. Pipe, Valves and Specialties for fire protection systems.
   4. Fire Sprinkling Systems.

E. The Owner's representative will return one set of this submittal to the contractor showing any corrections, additions, and/or deletions. This Contractor shall resubmit those items that need to be corrected or added.

1.12 CONTRACTOR'S COST BREAKDOWN

A. Mechanical Contractor shall submit, with the bound submittals, a cost breakdown of the major portions of his work, pursuant to the following outline.
   1. Job organization and submittals.
   2. Outside site utilities.
   3. Fire protection systems.

1.13 RECORD DRAWINGS, OPERATING INSTRUCTIONS, OPERATION AND MAINTENANCE RECORD (AS-BUILT) DRAWINGS

A. This Contractor shall maintain a set of Contract Drawings at the site on which the actual installed location of piping, equipment, etc., shall be shown in a legible, neat manner. This set of plans shall show actual dimensions (including depth of

bury) of underground piping from construction lines, so they can be readily found after covering. Upon completion of the project, the as-built information shall be transformed into AutoCAD version 2018 or greater. Record drawings shall be the same size as contract drawings. This set of plans shall be submitted for final approval. Drawings shall be one full size set, one half size set and on CD in PDF and .dwg format. The contractor shall be ready for review of the on-site as-builts monthly prior to submitting his billing. Failure to have drawings available for review may delay monthly billings.

1.14 OPERATING INSTRUCTIONS

A. Operate all systems through complete cycles in the presence of designated Owner's representative. Give instructions for operation, care and maintenance. All systems shall be operated through complete operating cycles for a minimum period of 7 days in conjunction with the designated Owner's representative before acceptance.

1.15 TRAINING

A. The Mechanical Contractor shall digitally record all Owner Mechanical training sessions and shall provide copies on DVDs. Training sessions shall be provided for all mechanical systems. Three copies of these DVDs shall be turned over to the Owner at the completion of the project.

1.16 OPERATION AND MAINTENANCE MANUALS (O&Ms)

A. General: Provide one preliminary searchable PDF set of Operation and Maintenance Manuals including maintenance information and parts list furnished by the manufacturer with the equipment, together with supplementary drawings where necessary, to itemize serving and maintenance points. Include the Valve Tag list(s) as posted in the Mechanical spaces. Include filter maintenance, methods of operation, seasonal requirements, manufacturer's data and warranty forms. Warranty forms are to be located in the front of the manuals as well as in each applicable section. Provide address and 24-hour phone number of the firms responsible under warranty. Items requiring service or correction during the warranty period shall be serviced within 24-hours of notification by Owner. Data in manuals shall be neat, clean copies, with operation and maintenance instructions for each item of equipment installed. Drawings shall be accordion folded. An index shall be provided with all contents listed in an orderly presentation with bookmarks according to specification section.

B. Number of Copies: A preliminary set of the O&M Manuals shall be submitted for approval. After this set has been approved, One hard copy and 3 electronic copies on USB flash drives shall be submitted.

C. Hard Copy Binding: Organize operating and maintenance data into suitable sets of manageable size. Copies shall be submitted in 3-ring binders. Covers shall include the name of the Job, Owner, Architect, Engineer, Contractor, and the year of completion. The back edge of the binder shall include a label with the name of the Job, the Owner and the year completed. Each copy shall have a typewritten index and tabbed dividers between equipment categories. Binders are to be no more than 80% full; binders that are over 80% full will be sent back for dividing into additional binders.

1.17 CERTIFICATIONS

A. Provide written certification that work has been fully completed in strict accordance with Plans and Specifications and request final inspection.

B. Provide written certification that Contractor will replace materials and workmanship that prove defective for one (1) year after date of acceptance or extended warranty as listed in individual sections.

C. Provide written certification of inspection from the Authority Having Jurisdiction, stating that all work has been inspected, accepted, and approved as complying with existing governing ordinances and codes.

D. Provide written certification that Owner's representative has been fully instructed in the operation and function of all mechanical systems.

E. Provide copies of certifications in the O & M Manuals.

1.18 DOCUMENTS

A. Present the following documents to the Owner's representative prior to final acceptance of buildings. Final payment of the Contract will be contingent upon receiving these documents:
   1. Record (as-built) drawings.
   2. Operation and Maintenance Manuals (3 sets).
   3. Final material submittal.
   4. Warranties and Extended Warranties.
   5. State of Washington certification of all pressure vessels installed on the project. Affix a copy to each tank.
   6. Final certificates of inspection and code compliance.
   7. RPBF device tests.
   8. All applicable forms required by these Specifications.
   9. Provide copies of the above documents in O & M Manuals.

1.19 WARRANTY

A. All fire sprinkling equipment and systems, including controls and all parts thereof, shall be warranted (parts and labor), for a period of one (1) year after the date of substantial completion as determined by the documentation.

B. Contractor shall repair or replace to the satisfaction of the Owner's representative any defective material, equipment, or poor workmanship, which may show itself during this warranty period.

C. All compressors used in fire sprinkling systems shall have an additional four-year parts warranty.

1.20 MECHANICAL ACOUSTICAL REQUIREMENTS

A. The noise criteria (NC) end resultant for each space shall be per Code as accepted by local jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUBMITTAL

A. Owner's representative's review of submittals is for general conformance with the design concept and Contract Documents. Marking or comments shall not be construed as relieving the Contractor from compliance with the project Plans and Specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy for confirming and correlating all quantities and assembly and for safe performance of his work.

END OF SECTION

SECTION 21 00 20

BASIC MATERIALS AND METHODS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. General requirements for basic materials and methods.

B. At a minimum, provide system per requirements of NFPA 13. Provide additional items as noted in these specifications. In the event that information in these specifications conflicts with NFPA 13, the more stringent requirements shall apply.

1.2 REFERENCES

A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

B. "Seismic Restraint Manual Guidelines for Mechanical Systems" by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

C. Sprinkler line attachments shall conform to NFPA Pamphlet 13. See Fire Protection Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. See specific sections for this requirement.

2.2 PRODUCT TESTING

A. Any piece of equipment used in this project and hereinafter specified which, by its nature, requires electrical connection, such as compressors, pumps, etc., must be provided with an approval label from one of the agencies hereinafter listed.

B. Approval from agency must be for the total package; approval of individual components not acceptable. Labels must be located outside of equipment and shall be visible to inspector. Comply with all requirements of RCW 19.28.010 and NEC Sections 90-7 and 110-3 (1993).

C. It shall be the responsibility of this Contractor or the equipment supplier to meet the requirements of this section. Any agency costs to provide appropriate label for a piece of equipment must be included in this bid. Failure by this Contractor or supplier to obtain approval labels prior to bid shall be sufficient cause for this Contractor/supplier to obtain all such labels at no additional cost to Owner. The following is a list of approval testing laboratories:
   1. Underwriters Laboratories, Inc., www.ul.com
   2. Canadian Standards Association, www.csagroup.org
   3. American Gas Association, www.aga.org.
   4. Factory Mutual Systems, www.fmglobal.com

5. MET Electrical Testing, www.metlabs.com
6. Intertek Testing, www.intertek.com

2.3 PRESSURE VESSELS

A. At the completion of the project, the Contractor shall provide State of Washington Certification of all pressure vessels installed on the project. Affix certification on the vessels and provide a copy to the Owner in the O & M Manual.

2.4 DAMAGED OR REJECTED MATERIALS

A. Remove from the site immediately.

2.5 FIRE INTEGRITY - PENETRATION SEALING SYSTEMS

A. Manufacturers
   1. 3M Fire Products
   2. Holdrite
   3. Approved equal

B. The penetration sealing systems shall be provided with F-Rating and/or T-Rating as required by IBC Section 714.3 and 714.4. Penetrations include the following:
   1. Through-penetration firestopping in fire-rated construction.
   2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction.
   3. Construction-gap firestopping occurring within fire-walls, floor or floor-ceiling assemblies.
   4. Construction-gap firestopping in smoke partitions.
   5. Through-penetration smoke stopping in smoke partitions.
   6. Construction-gap smoke stopping in smoke partitions.
   7. All piping penetrating mechanical spaces, mechanical mezzanines, mechanical lofts, mechanical boiler rooms, or other mechanical spaces, shall be fire caulked, even if the walls are not rated. Visible piping penetrations shall be covered by split chrome-plated floor and ceiling plates.

C. All products shall be listed in Underwriters Laboratory Fire Resistance Directory. Firestopping for penetrations and voids shall be UL-tested systems
   1. Through-penetration firestop devices (XHCR).
   2. Fire resistance ratings (BXUV).
   3. Through-penetration firestop systems (XHEZ).
   4. Fill, void or cavity material (XHHW).

D. All material shall be tested per American Society for Testing and Material Standards, ASTM E814: Standard test method for fire tests of through-penetration firestops.

E. Firestopping for penetrations and voids shall be UL-tested systems.

2.6 HANGERS

A. Manufacturers
   1. Grinnell
   2. Michigan Hanger
   3. Tolco
   4. PHD

5. Anvil
6. Holdrite
7. Approved equal

B. Provide all anchors, hangers and all supports for piping and equipment included in contract.

C. It is the responsibility of the Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard, commercially-accepted pipe hangers and accessories.

D. All pipe hangers and supports shall conform to the latest requirements of ASME B31.1 Code for Pressure Piping, and Manufacturers Standardization Society Documents MSS SP-58 and MSS SP-69.

2.7 INSERTS AT HANGERS AND SUPPORTS

A. Manufacturers:
1. Holdrite
2. Buckaroos
3. Cooper
4. Metro Supply Company
5. Value Engineered Products, Inc.
6. Hydra-Zorb Klo-Shure 7-series or 8-series strut-mount and Clevis
7. Approved equal

B. Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. The insert is to consist of either hydrous calcium silicate or polyisocyanurate foam insulation (urethane) encircling the entire circumference of the pipe with a 360-degree PVC (1/16” thick) or galvanized steel jacket (20 gauge minimum). Inserts are to be installed on piping during piping installation, by the Piping Contractor. Provide continuous insulation vapor barrier. Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor retarder mastic.

C. For elastomeric insulation, provide Hydra-Zorb Klo-Shure 7-series 8-series strut-mount or Clevis Hanger Insulation Couplings or approved equal.

D. Insulation and covering shall meet the flame spread index and smoke developed index as noted in the International Building Code.

E. Insert thickness shall match Code-required insulation thickness as a minimum.

F. Provide pipe covering protection saddle for piping on rollers; Anvil figure 160 through 166A or approved equal.

G. Inserts for piping in plenums shall have appropriate flame/smoke spread rating.

2.8 ACCESS DOORS AND PANELS

A. Manufacturers:
1. Jay R. Smith
2. Milcor
3. Mifab
4. Approved equal.

B. 16 gauge steel door and frame with concealed hinge and cylinder lock. Provide matching latches/locks keyed the same for multiple panels in a project. When "B"

dimension is 24" or more, provide additional latches at the top and bottom of door. Provide finish and material as noted in Part 3 – Execution.

2.9 CONCRETE INSERTS

A. Manufacturers:
1. Grinnell
2. Kinsdorf
3. Elcen
4. Approved equal.

B. Inserts in concrete for the suspension of piping and equipment shall be provided by this Contractor, unless otherwise noted on the Plans. Inserts in "poured-in-place" concrete shall be Grinnell 282 galvanized, or approved equal.

2.13 VIBRATION AND SEISMIC CONTROLS

A. Manufacturers:
1. Kinetics Noise Control, Inc.
2. Mason Industries
3. Amber-Booth
4. I.S.A.T.
5. Flexicraft
6. Twin City Hose
7. Approved equal.

B. General
1. If equipment is internally isolated by the manufacturer, internal isolation (base and isolator) shall be equivalent to the scheduled base and isolator and the isolator shall meet the scheduled spring static deflection.
2. Size anchoring bolts to withstand lateral seismic shear and isolate bolts from direct contact with structure using bolt isolation washer and bushing.
3. Bases specified in the schedule can be supplied by the manufacturer of the equipment if they meet the specification given herein.

C. Pipe Isolation - General
1. Motion Restraint Snubber: seismic restraint cable, rod clamp for standard 1-5/8" x 1-5/8" unistrut, and clevis cross brace.

D. Piping not requiring sway bracing is as follows:
1. Piping in mechanical spaces less than 1".
2. All other piping less than 2-1/2".
3. Piping suspended by hangers 12" or less in length measured from the top of the pipe to bottom of hanger support where the hanger is attached.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

A. Locate all general reference points as established by the General Contractor and take such action as is necessary to prevent their destruction; lay out work and be responsible for all lines, elevations, grading for utilities and other work executed under the Contract. Exercise proper precautions to verify figures shown on drawings, before laying out work and be responsible for any errors resulting from failure to exercise such precaution. The coordination of the utility installation with

the final site grading and elevation by the General Contractor shall be the responsibility of this contractor. Locate existing utility lines which will be affected by the building location before any footing work begins. Report conflicts with the Plans to the Owner's representative for adjustment before proceeding with the work. Failure to follow this instruction will result in the contractor being required to alter his work at his own expense.

3.2 ELECTRICAL WORK

A. All electrical work performed under this Section of the Specification shall conform to all applicable portions of the Electrical Section of the Specifications, and shall conform to all applicable codes.

3.3 WORKMANSHIP

A. Furnish and install all equipment for a neat and finished appearance. If it is the opinion of the Owner's representative that any portion of the work has not been installed in a workmanlike manner, or has been left in a rough unfinished manner, Contractor will be required to remove and reinstall the equipment, and patch and paint surrounding surfaces in a manner satisfactory to the Owner's representative. This shall be completed without any increase in cost to the Owner.

3.4 EXCAVATION - GENERAL

A. Perform all necessary excavation, shoring and backfilling required for the proper installation of work inside the buildings and premises, or outside as may be necessary. Slope sides of excavation to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

B. Excess excavation shall be backfilled with gravel or sand and mechanically compacted to give full support to the piping. No underground lines shall be covered until the installation has been approved by the Owner's representative, and the local Authority Having Jurisdiction. Maintain sides and slopes of excavations in safe condition until completion of backfilling. All backfill shall be thoroughly compacted.

C. No cinders shall be used for backfilling where steel, iron or copper piping is used. All trenches near or under footings shall be cut only after approval of the Owner's representative, and all backfilling of such trenches shall be according to his direction.

D. All items of grading which will in any manner affect the bearing capacity of the soil foundations upon which will be placed floor slabs, walls, column footings or pipe beds shall be performed to the satisfaction of the Owner's representative. All soil foundation areas which will in any manner support any of the above-stated construction will be compacted by the use of mechanical tampers to at least 95% of the maximum density of the soil foundations as determined by the compaction control test, in accordance with the "Method of test for Moisture Density Relations of Soils, ASTM Designation D1557." The moisture control at the time of compaction shall be uniform throughout the area and shall not vary more than 5% above or below the optimum moisture content as determined by the above described "Compaction Control Test." Place fill in 8" loose layers, each layer compacted.

E. Division 31 (31 23 16 - Excavation, 31 23 23 Fill, 31 26 16.13 Trenching) shall provide Excavation, Fill and Trenching for this contractor, as needed to complete his work.

3.5 EXCAVATION DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations, and from a flooding project site and/or surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions, outside excavation limits to convey rain water and water removed from excavations to collection points or run off areas. Do not use trench excavation as temporary drainage ditches.

3.6 EXCESS EXCAVATION MATERIAL

A. Dirt and debris from trench excavation shall be disposed of by this Contractor, as directed by the Owner's representative.

3.7 PIPING INSTALLATION

A. Lay piping in straight lines with uniform slope, leave no pockets. Care shall be taken to keep all foreign materials out of the piping during installation. Where ground water is present, provide suction pumps to keep trenches free of water, and cap ends of piping exposed to ground water when work is interrupted.

B. All underground piping used for the distribution of fire protection services located outside the building perimeter shall be buried a minimum of 36" from finish grade to top of piping.

C. All piping run above the floor SHALL NOT BE LOCATED OVER ELECTRICAL PANELS OR SWITCHBOARDS, except where located above a structural ceiling, or with drain pans approved by the AHJ. Piping includes, but is not limited to, fire sprinkler lines.

D. All piping SHALL BE ROUTED AROUND Elevator Equipment Rooms. Piping may serve the room, but shall not pass through it. Follow all codes applicable to these areas.

E. Provide access panels to valves located above hard ceilings.

3.8 OPENINGS IN PIPING

A. Keep all openings covered tightly with plastic during the work.

3.9 PIPE SLEEVES

A. General: Provide pipe sleeves for piping passing through foundations, walls, floors, partitions, and roof to allow piping to pass freely through.

B. Foundation Walls: Where piping passes through walls below finished grade, but does not enter the building spaces, the sleeves shall be Schedule 40 galvanized steel pipe. Provide a modular seal between the sleeve and the piping.

C. Building Walls (Below Grade) and Floor Slabs: Where piping passes through building walls below grade, and floor slabs on grade or below grade, the sleeves shall extend a minimum of 1" inside the building wall or above the finished floor level, and shall be made watertight and gas tight by the appropriate modular seal. Sleeves shall be Schedule 40 galvanized steel pipe. If the sleeve and modular seal are subject to trapping water on the top side, pack with water-resistant foam and caulk with flexible caulking or grout.

D. Building Walls and Floor Slabs (Above Grade) - New Construction: Where piping passes through concrete walls or floors within the building, the sleeves shall be of sufficient strength to withstand the pressure and concrete pouring operation without deforming or rupturing. Sheet metal ductwork with ends slit and formed into flanges is not acceptable. Sleeves shall extend 1" above the finished floor. Sleeves in walls shall be flush on both sides.

E. Piping Subject to Expansion: where piping is subject to motion due to expansion, the sleeve shall be made large enough to allow free motion. When piping passing through is insulated, the sleeve shall be large enough to permit the covering to pass through.

3.10 WALL/FLOOR PLATES AND ESCUTCHEONS

A. Where piping passes through any wall, floor or ceiling, it shall be fitted with chromium-plated steel escutcheons, with suitable set screws or other approved holding device. Where extended sleeves are necessary, the plates shall be of sufficient depth to cover the sleeves.

3.11 CONCRETE INSERTS

A. Inserts shall be installed in forms as work progresses.

B. See structural details for hangers in pre-cast floor panel systems and post-tensioned floor systems.

3.12 PIPE HANGERS AND SUPPORTS

A. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger location, in order to prevent excessive stress in either pipe or equipment connections.

B. Concrete Inserts: Where piping is supported from the concrete structure, inserts shall be provided for rod sizes up to 3/4". Where support rod sizes exceeds 3/4" diameter or where pipe load exceeds the recommended load for the inserts, use two inserts with a trapeze-type connecting member below the concrete.

C. Where piping is to be supported from building steel, beam clamps shall be used. Beam clamp selection shall be for the required load and the configuration of the steel at the point of attachment. Drilling holes in the steel for hanger rod will not be permitted unless approved by the Structural Engineer. Use only adjustable side beam clamps (Type 25); standard beam clamps are not acceptable.

D. Riser Clamps (Vertical Piping): Piping shall be supported at each floor with a riser clamp or at sufficient intervals to carry the weight of the piping and that of its contents. Stacks shall be supported at their base by a concrete pier or by a suitable hanger located on the horizontal run, close to the riser. Riser clamp

extensions shall rest on the building structure where possible; auxiliary steel supports shall be provided where it is impractical to rest directly on the building structure.

E. Angle Clips: Where piping is to be supported from building wood structure, angle clips shall be used with lag bolts sized to support the load in shear. Any attachment to wooden structural members shall be subject to the approval of the Structural Engineer.

F. Hanger Rods: Hanger rod size shall be selected on the basis of loading from the following table:

3/8"	610 pounds
1/2"	1130 pounds
5/8"	1810 pounds

G. Hangers shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing. DO NOT BEND RODS.

H. All rods shall be electro-plated to prevent corrosion.

I. All rods shall be double-nutted with lock washer and cut washer, on both ends if applicable, and excess rod on the bottom shall be cut flush and ground for safety.

J. Hanger Spacing: The maximum allowable spacing for pipe hangers shall be in accordance with the following. Where concentrated loads of valves, fittings, etc., occur, closer spacing will be necessary and shall be based on the weight supported and recommended loads for the hanger components.

1. Spacing:
   a. Copper Tube and Piping - Soldered, Brazed or Welded:
      1) Horizontally: 1-1/2" and smaller, 6'; 2" and larger, 10'.
      2) Vertically: Each floor, not to exceed 10'. See note 1.
   b. Steel and Brass Piping - Threaded or Welded:
      1) Horizontally: 3/4" and smaller, 10'; 1" and larger, 12'.
      2) Vertically: Every other floor, not to exceed 25'. See note 1.
   c. Notes Referenced Above:
      1) Vertical water lines may be supported in accordance with recognized engineering principles with regard to expansion and contraction when first approved by the Authority Having Jurisdiction.
      2) See the appropriate IAPMO Installation Standard for expansion and other special requirements.

K. Hangers - Horizontal Piping:

1. General: All hangers shall be provided with means of vertical adjustment. The following schedule shall be followed to select acceptable hangers for the type of service.
   a. Non-Insulated Steel Piping:
      1) Adjustable Split Ring Swivel Hanger
      2) Adjustable steel Band Hanger
      3) Clevis Hanger
2. Roller Hangers: Provide roller hangers for all applications where thermal movement causes hanger rods to deviate more than 4 degrees from vertical, or longitudinal movement exceeds 1/2". Provide roller hangers used in conjunction with protection saddles to suit the insulation thickness.

3. Trapeze Hangers: Where piping is grouped in parallel, provide manufactured strut or trapeze hangers consisting of two steel angles bolted back-to-back, with space between for a hanger rod at each end. Where the length of angles is greater than 24", there shall be three (3) rod supports. Piping shall be able to move independently, and hanger spacing shall be dictated by the smallest pipe.
4. Brackets and Racks: Where piping is run adjacent walls or steel columns, welded steel brackets shall be used as base supports. Multiple pipe racks or trapeze hangers shall be designed and fabricated to suit conditions.
5. Anchors, Guides and Sliding Supports: Shall be as shown on the drawings or as necessary to prevent excessive stress in either piping or equipment.
6. Auxiliary Steel: All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC Steel Handbook, furnished by the Contractor, and shall receive one shop coat of primer paint.
7. Submittals: The Contractor shall submit the following information and data for approval prior to installation.
    a. Data Sheets on all cataloged items to be used.
    b. Sketches covering all specially designed hanger assemblies and fabrications.

3.13 CUTTING AND PATCHING (NEW WORK)

A. Furnish dimensions and locations of openings to other Contractors doing the work. Provide ample time to avoid delays and unnecessary labor. Cutting and patching made necessary to admit work, repair defective material or workmanship, or by neglect to anticipate proper requirements, shall be done by the General Contractor. at the expense of this contractor.

3.14 ACCESSIBILITY

A. Locate valves, etc., so as to be easily accessible in mechanical spaces or through access panels, specified hereinafter. Otherwise, obtain Owner's representative's approval of location.

B. Any equipment requiring maintenance clearances for servicing of filters, motors, compressors, etc., shall be carefully coordinated to avoid servicing problems. Failure of contractor to comply with this requirement shall be sufficient cause for contractor to make all necessary changes at no cost to the Owner. To avoid problems with interpretation of the NEC, allow 42" for all electrical clearances.

3.15 ACCESS DOORS AND PANELS

A. Locations of panels shall be carefully selected during construction, so as not to be located behind cabinets, etc. Coordinate closely with the Architectural and Electrical Plans before installing panels.

B. In areas such as janitor's room or on painted walls, etc., access panels shall be prime-coated and painted by the General Contractor; install before surrounding surfaces have been painted. In areas such as toilet rooms, the access panels shall be stainless steel or chrome-plated. In other finished areas such as on ceilings, all access panels shall have the same type of finished surface as that of the surrounding area.

C. Verify with the Owner's representative location and finish prior to ordering; failure to get the Owner's representative's approval may result in replacement of access panels at the Contractor's expense. Minimum size of access doors is 12" x 12"; actual size depends on the specific circumstance, and panel shall be large enough to accomplish replacement or repair of the item requiring access. The Owner's representative shall have the final say on whether or not the access is of sufficient size.

D. Provide access panels for all concealed valves for all piping.

E. Doors shall have cylinder lock latches, all keyed alike.

F. Provide fire-rated access doors for one-hour or two-hour rated walls and ceilings; units shall be UL labeled.

3.16 ACCESSES

A. Provide suitable access to all equipment requiring servicing, maintenance, replacement, or repair. In concealed spaces where access has not been provided by the Architect by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the Owner's representative, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades, to avoid conflict therewith, and such locations shall be approved by the Owner's representative prior to installation of access panels.

3.17 PAINTING, TAGS, ETC.

A. Field painting of all fire sprinkler equipment, piping etc., located in and exposed in occupied spaces, shall be by the General Contractor. See Architectural painting specification.

B. Identification Tags: Provide identification tags for each main shutoff and control valve throughout the building indicating the system served. Tags shall be black phenolic plastic with white engraved inscription attached with chrome chain.

C. Provide valve tag lists under glass. Locate as directed by Owner's representative.

D. Each major item of fire equipment shall be provided with the name of the item, i.e., Pump No. 1, etc., in labels of black phenolic plastic with white engraved inscription. Minimum size of lettering is 1" with a maximum of 2". Select appropriate sizes for the size of the equipment being labeled. Align labels with edges of equipment and locate labels so as to be visible.

E. Pipe Markers:

1. Piping throughout the building shall equal to Brady Corporation No. B-946, M.S.I. No. MS-900, meeting or exceeding ANSI A13.10-1981. Pipe markers shall consist of two wraps of arrows in the direction of flow, color, and wording as indicated in the schedule following. Stencils shall be visibly located and spaced on maximum 20'-0" centers for long straight piping runs. Stencils shall be located on both sides of a wall, within the first 3'.
2. Color Code Schedule:

Service	Color	Stencil
Fire Protection	Red	FIRE

3. Ceiling Tile Access Labels: Where it is necessary to remove ceiling tile(s) to access valves, etc., provide and install round 1/2" diameter, red, self-

adhesive labels on the metal ceiling grid, visible near all four corners of each tile requiring removal.

3.18 TEST PLUGS AND GAUGES

A. A minimum of six (6) compatible pressure gauges (including pressure gauge adapters) and six (6) compatible temperature gauges shall be provided.

B. P&T test plugs included on other devices that serve the same purpose and that provide the same information are acceptable; duplicates are not required.

3.19 FIRE INTEGRITY

A. All penetrations of fire-rated walls, ceilings, roofs or floors via piping must be protected by appropriately-rated assemblies and caulking to maintain integrity of structure.

3.20 CLEANING UP

A. Comply with requirements of the General Specifications.

3.21 CAULKING

A. Caulk all openings and flash around all piping and equipment passing through roof, floor, and walls. All caulking shall be water resistant. See also paragraph "Fire Integrity" for piping penetrations of rated walls, ceilings, roofs, or floor penetrations.

B. All piping penetrations of walls, ceilings, and floors shall be caulked. A chrome-plated steel escutcheon plate shall be installed at each visible piping penetration of walls, ceilings, or floors.

3.22 OPERATION OF EQUIPMENT AND SYSTEMS

A. Contractor is responsible during all periods of testing. Provide temporary utilities as required.

3.23 TESTS, ADJUSTMENTS AND INSPECTION

A. Test all work thoroughly and systematically, both during construction and after completion. Notify Owner's representative 48 hours in advance of all tests. Tests shall be maintained until approved. Tests shall be as hereinafter specified.

B. The Contractor shall test the completed installation as in regular service. Any defects or imperfections that may show up are to be promptly corrected. The Contractor shall guarantee the entire system and all parts thereof for a period of one year from date of final acceptance. The Contractor shall repair or replace any part which may show signs of failure during that time, if such failure, in the opinion of the Owner's representative, is due to imperfections in material or to improper workmanship.

C. No system, whether prescribed for testing or not, shall be covered or concealed below ground, in walls, in ceiling spaces, or generally from ease of viewing, without first notifying the Owner's representative. Failure to notify the Owner's representative for inspection of concealed systems shall be cause to require this contractor to uncover and re-cover such systems at no additional cost to Owner.

D. A log of all tests shall be kept. The log shall note, dates, time of day test started, system or portion of system tested, length of test, test results, and who witnessed the test (AHJ, Owner's representative, or GC). Contractor shall insert legible name of witnesses. Contractor to submit a copy of the contractor's test log monthly to the Owner's representative.

E. Review the project to determine when final inspection is appropriate and advise Owner's representative. Contractor is required to complete his work before requesting final inspection.

F. See specification section of piping used for test methods or procedures to be followed.

3.24 FINAL INSPECTION

A. This contractor shall thoroughly review and inspect the project to determine when final inspection is required, and shall so advise the Owner's representative. It shall be understood that the work is to be essentially complete. If such is not the case and more than one final inspection and one backcheck are necessary, this Contractor may be billed for the additional backchecks at the then governing rate for the personnel involved. The final inspection punchlist shall be legibly signed on a copy of the punch list by a person responsible for the trade involved, and transmitted to the Owner’s representative, before a backcheck will be scheduled.

3.25 PROTECTION AND CLEANING

A. All equipment and material installed by this contractor shall be properly protected from damage during the course of construction. All equipment shall be thoroughly cleaned before final inspection.

B. In attic or other spaces where piping has been installed at floor level and interferes with foot traffic, this contractor shall provide covers to protect this piping. Wood or other such material will be acceptable.

C. Provide and protect walking paths in mechanical spaces. Maintain 6'-8" minimum headroom for all piping. If the required clearance is not possible, obtain permission from the Owner's representative to violate the above requirement, and comply with protective measures required.

3.26 SPECIAL PROTECTION

A. Exercise maximum precaution to protect the building and equipment from damage of any kind, and in particular, prevent water and dust seepage into new equipment.

3.27 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

A. Scope: Following installation of mechanical work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner's representatives.

B. General Description of Instruction Periods: Each period shall include preliminary discussion and presentation of information from maintenance manuals with appropriate references to drawings, followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures, and available adjustments.

C. Scheduling of Instruction Periods: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given to the Owner's representative at least two weeks prior to the instruction periods, and agreement reached as to the date at which the instruction periods are to be performed. Advise Owner's representative two weeks prior to date when ready to conduct instruction and demonstrations; receive approvals of proposed date prior to making final arrangements.

3.28 ON-SITE OBSERVATIONS AND SAFETY MEASURES

A. During its progress, all work shall be subject to observation by the Owner's representative, and by the National Board of Fire Underwriters, State and Local Inspectors. The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The Contractor will be totally responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Owner's representative to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. It shall be the Contractor's responsibility to comply with "Safety and Health Regulations for Construction" in the Federal Register by the U.S. Department of Labor. Contractor shall be responsible for providing all such safety measures and shall consult with the State and/or Federal Safety Inspector for interpretation whenever in doubt as to whether he is or is not in compliance with State and/or Federal regulations. Furthermore, the Contractor distinctly assumes all risk or damage or injury to any persons or property wherever located resulting from any action or operation under this contract or in connection with the work.

3.29 DRAFT STOPS

A. It shall be the responsibility of each contractor performing his trade to verify with Architectural Plans and to maintain the integrity of draft stops, whenever his work requires penetration of these areas. Patch as required to maintain integrity of draft stops.

3.30 COMMISSIONING

A. This Contractor will be required to participate in the commissioning process. The Contractor shall complete the start-up forms and be available to assist in the commissioning process. The Contractor shall include in his bid all cost associated with his portion of the commissioning process.

B. The following systems shall be commissioned:
   1. Fire Sprinkling System.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler and/or standpipe systems.

1.2 RELATED REQUIREMENTS

A. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Piping identification.

B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

C. Section 21 12 00 - Fire-Suppression Standpipes: Standpipe design.

D. Division 31 - Excavation, Fill, Trenching.

1.3 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers.

C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.

D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.

E. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; (ANSI/ASME B16.5).

F. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers.

G. ASTM A 47 - Standard Specification for Ferritic Malleable Iron Castings

H. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

I. ASTM A 135 - Standard Specification for Electric-Resistance Welded Steel Pipe.

J. ASTM A 795 - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

K. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids; American Water Works Association.

L. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; (ANSI/AWWA C111/A21.11).

M. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; (ANSI/AWWA C151/A21.51).

N. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.

O. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association.

P. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; National Fire Protection Association.

Q. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.

R. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.

S. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.

T. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

B. Grooved joint couplings and fittings shall be referred to on drawings and product submittals and shall be identified by the manufacturer’s style or series designation. Trade names and abbreviations are not acceptable.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and valve tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. All grooved joint couplings, fittings, valves, and specialties shall be of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

C. All castings used for fittings, couplings, valve bodies, etc., shall include a cast date stamp for quality assurance and traceability.

D. Conform to UL and FM requirements.

E. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

F. The installer shall possess a valid state of Washington "Fire Sprinkler Contractor's License". Provide a copy with the submittals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Standpipe and Hose Systems: Conform to NFPA 14.

C. Welding Materials and Procedures: Conform to ASME Code.

D. Below Ground systems : Conform to NFPA 24.

2.2 BELOW-GROUND PIPING

A. Pipe: Provide piping in accordance with NFPA 24. Piping shall be UL-listed for fire protection service and comply with AWWA Standards. Design working pressure shall not be less than 150 PSI. Ferrous metal pipe shall be lined and coated in accordance with NFPA 24. Ductile Iron Pipe: AWWA C151/A21.51.

B. Below-Ground Systems
1. Fittings: Fittings shall be compatible with pipe system and be provided to the same criteria. AWWA C110, standard thickness.
2. Joints: AWWA C111, rubber gasket.
3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.
4. Thrust Blocks: Provide thrust blocking at all below-grade elbows.
5. Buried Utility Warning and Identification Tape: Provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3" minimum width, color-coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "Caution: Buried Water Piping Below" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.3 ABOVE-GROUND PIPING

A. Piping: Provide steel pipe per NFPA 13 and NFPA 14, except as modified herein.
1. Steel Pipe: ASTM A 53 Schedule 40, black, unless otherwise specified. Steel piping shall be Schedule 40 minimum for sizes less than 8", and Schedule 10 for sizes 8" and larger.
2. Iron Fittings: ASME B16.1, flanges and flanged fittings, ASME B16.4 and threaded fittings.
3. Mechanical Grooved Couplings: Two ductile-iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, ASTM A449 electroplated steel bolts, nuts, and washers; galvanized for galvanized pipe.
a. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully

installed at visual pad-to-pad offset contact. Tongue and recess type couplings, which require the use of a torque wrench to achieve the exact required gap between housings, are not permitted. Victaulic Style 009H and 107N (Quick-Vic™). Installation ready rigid coupling for direct stab installation without field disassembly.

b. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Installation-Ready Style 177 or Style 77.

B. Above-Ground Systems
1. Shop welding allowed per NFPA 13, NO field welding allowed. Perform welding in the shop; field-welding will not be permitted.
2. Steel piping with wall thickness less than Schedule 30 shall not be threaded.
3. Conceal piping in finished area, unless otherwise indicated.

C. Fittings: Provide fittings for changes in direction of piping and for connections.
1. Fittings shall be UL-listed or FM-approved for use in wet pipe sprinkler systems.
2. Fittings, mechanical couplings, and rubber gaskets shall all be supplied by the same manufacturer.
3. Short-pattern fittings shall have flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
4. Rubber-gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1-1/2" and larger.
5. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type.
6. Plain end fittings with mechanical couplings, and fittings which use steel gripping devices to bite into the pipe when pressure is applied, will not be permitted.
7. U-bolt connected threaded mechanical tees will not be permitted.

2.4 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2" to 1-1/2": Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2" and Over: Carbon steel, adjustable, clevis.

C. Wall Support for Pipe Sizes to 3": Cast iron hook.

D. Wall Support for Pipe Sizes 4" and Over: Welded steel bracket and wrought steel clamp.

E. Vertical Support: Steel riser clamp.

F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 GATE VALVES

A. Up to and including 2":
1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2":

1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, grooved or flanged ends. Basis of Design: Victaulic Series 771.

2.6 GLOBE OR ANGLE VALVES

A. Up to and including 2":
1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2":
1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.7 BALL VALVES

A. Up to and including 2":
1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle or with weatherproof actuator housing and handwheel, and balancing stops, threaded ends with union. Basis of Design: Victaulic Series 728.

B. Over 2":
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10" and over, flanged.

2.8 BUTTERFLY VALVES

A. Cast or Ductile Iron Body
1. Cast or ductile iron, chrome or electroless nickel-plated ductile iron or aluminum bronze disc, resilient replaceable EPDM pressure responsive seat, wafer, lug, or grooved ends, extended neck. Weatherproof actuator housing with handwheel, and gear drive, integral indicating device, and external tamper switch rated 15 amps at 115 volt AC. Coordinate voltage with EC. Basis of Design: Victaulic Style 705.

2.9 CHECK VALVES

A. Up to and including 2":
1. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2":
1. Iron body, stainless steel or bronze trim, spring-assisted swing check with stainless steel or rubber-coated disc, renewable disc and seat, flanged or grooved ends. Suitable for vertical or horizontal installation. Basis of Design: Victaulic Series 717.

2.10 DRAIN VALVES

A. Compression Stop:
1. Bronze with hose thread nipple and cap.

B. Ball Valve:
1. Brass with cap and chain, 3/4" hose thread.

2.11 BACKFLOW PREVENTER - DOUBLE DETECTOR CHECK VALVE ASSEMBLY

A. Provide backflow preventer listed by the State of Washington and local jurisdiction as an approved cross-connection control device for fire protection.

B. Backflow preventer shall have the following ratings; UL, FM, ASSE1048.

C. The backflow preventer shall have OS&Y gate valves as manufactured by Watts, Febco, or approved equal.

2.12 VAULTS

A. Provide pre-cast concrete vaults for installation of double check valve assemblies.

B. Vaults shall be sized to provide for clearance around valves for maintenance access.

C. Provide cover with locking hatch.

D. Provide ladder steps cast into concrete vault walls.

E. Vault top/cover shall be selected in order to withstand anticipated external loading.

F. Vaults shall be manufactured by Utility Vault Co. or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise indicated or specified, all materials and equipment shall be installed and tested in accordance with the manufacturer's recommendations and in accordance with NFPA 13, NFPA 14, and NFPA 24. Cutting structural members for passage of piping or for pipe-hanger fastenings will not be permitted.

B. Until approval has been obtained from the Authority Having Jurisdiction, shop fabrication or installation may proceed at the Contractor's risk. The Contractor shall make all changes to fabricated or installed components in order to conform to the Plans approved by the Authority Having Jurisdiction.

C. The location of ductwork, other piping, and other equipment takes precedence over sprinkler piping. Provide all offsets, fittings, and transitions required to install the sprinkler system in the available space as part of the scope of work.

D. Coordinate with Fire Alarm Contractor. Provide all information concerning the connection and operation of tamper switches, alarm valves, flow switches, and all other indicating devices.

E. Coordinate with Electrical Contractor. Provide all information concerning the connection and operation of devices requiring electrical power.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Unions and flanges for servicing or disconnect are not required on installations using grooved joint couplings. The couplings shall serve as disconnect points.

3.3 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

C. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.

D. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Attend coordination meetings with other subcontractors to layout work. Failure to participate gives last priority to this subcontractor for space or work flow.

G. Group piping whenever practical at common elevations.

H. Sleeve pipes passing through partitions, walls, and floors.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.
   2. Place hangers within 12" of each horizontal elbow.
   3. Use hangers with 1-1/2" minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

K. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

L. Do not penetrate building structural members unless indicated or written permission is received from the structural engineer.

M. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required. On floor and subgrade sleeves use modular seals to prevent leakage. Fill sleeve void with water resistant foam and caulk or grout, flush with top of sleeve.

N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

P. Provide gate valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping, and apparatus.

END OF SECTION

SECTION 21 12 00

FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Standpipe system.

B. Fire department connection.

1.2 RELATED REQUIREMENTS

A. Section 21 05 00 - Common Work Results for Fire Suppression: Fire protection piping.

B. Section 21 13 00 - Fire-Suppression Sprinkler Systems.

C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

D. Division 31 - Excavation, Fill, Trenching.

1.3 REFERENCE STANDARDS

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation.

B. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association.

C. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.

D. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.

B. Shop Drawings:
   1. Indicate supports, components, accessories, and sizes.
      a. Submit shop drawings to authority having jurisdiction for approval.
      b. Submit proof of approval to Architect and Engineer.
   2. Project Record Documents: Record actual locations of components.
   3. Operation Data: Include manufacturer's data.
   4. Maintenance Data: Include servicing requirements and test schedule.
   5. Certificates: Provide certificate of compliance from Authority Having Jurisdiction indicating approval of field acceptance tests.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Perform work in accordance with NFPA 14.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience. Include written certificate with submittals.

1.6 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in shipping packaging until installation.

PART 2 - PRODUCTS

2.01 FIRE HOSE CABINETS

A. Hose Cabinets:
   1. Style: Recessed mounted.
   2. Tub: 16 gage thick steel, prepared for pipe and accessory rough-in.
   3. Door: 12 gage thick steel, flush, glazed with 1/4" thick wired glass full panel; hinged, positive latch device.
   4. Finish: Prime Coated.

B. Hose Rack: Steel with polished chrome finish; swivel type with pins and water stop.

C. Hose: 1" diameter, 50' long linen hose, mildew- and rot-resistant.

D. Nozzle: Chrome plated brass; combination fog, straight stream, and adjustable shut-off.

2.2 VALVES

A. Hose Station Valve: Angle type, chrome plated finish, 1-1/2" nominal size with automatic ball drip; refer to Section 21 05 00.

B. Hose Connection Valve: Angle type; chrome plated finish; 2-1/2" size, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of same material and finish; refer to Section 21 05 00.

C. Pressure Reducing Valve: Angle type; brass finish with inner hydraulic controls; 1-1/2" size, thread to match fire department hardware, 400 psi inlet pressure, with threaded cap and chain of same material and finish; refer to Section 21 05 00.

2.3 FIRE DEPARTMENT CONNECTION

A. Type: Flush mounted wall type with brass finish.

B. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.

C. Drain: 3/4" automatic drip, exterior.

D. Label: "Standpipe - Fire Department Connection".

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 14.

C. Locate and secure cabinets plumb and level. Establish top of cabinet (inside horizontal) surface 66" above finished floor.

D. Locate hose station valve in cabinet at 60" above finished floor.

E. Connect standpipe system to water source ahead of domestic water connection.

F. Where static pressure exceeds 100 psi at any hose station, provide pressure reducing valve to prevent pressure on hose exceeding 90 psi.

G. Provide two-way fire department outlet connection on roof when required.

H. Flush entire system of foreign matter; have Owner's representative witness flushing.

I. Hydrostatically test entire system.

3.2 FIELD QUALITY CONTROL

A. Test entire system in accordance with NFPA 14.

B. Test shall be witnessed by Authority Having Jurisdiction and Owner’s representative.

C. Provide 2 hours of instruction to the Owner's personnel, at a time acceptable to the Owner. These hours may be added to the other Fire Protection Sections for total hours of training available to the Owner.

END OF SECTION

SECTION 21 13 00

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 RELATED REQUIREMENTS

A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe, fittings, and valves.

B. Section 21 12 00 - Fire-Suppression Standpipes

C. Section 22 05 53 - Identification for Plumbing Piping and Equipment

D. Division 31 - Excavation, Fill, Trenching

1.3 REFERENCE STANDARDS

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.

C. NFPA 101 - Safety to Life from Fire in Buildings and Structures (Life Safety Code).

D. NFPA 170 - Fire Safety Symbols.

E. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.

F. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Predesign Meeting: Convene one week before starting design work for this section.

1.5 SCOPE OF WORK

A. Design, fabricate, and install a complete wet pipe and/or dry pipe fire sprinkler system in accordance with the Standards set forth in this Section and as conceptually described on the Plans.

B. Obtain and pay for all permits and fees required by the Authority Having Jurisdiction.

C. Arrange for, perform and pay all fees associated with all tests required by the Authority Having Jurisdiction.

D. Unless otherwise determined by the Authority Having Jurisdiction, occupancy shall be as defined in NFPA 13, Annex A.

E. Obtain and pay for all power requirements needed for any part of the Fire sprinkler design build system.

1.6 DESIGN CRITERIA

A. Systems shall be hydraulically designed in accordance with NFPA 13 and NFPA 14.

B. Water Supply Information: Obtain water flow test information from the local water purveyor.

C. Provide complete sprinkler coverage for building and overhangs.

D. Provide a control assembly consisting of a supervised control valve, pressure gauge, test/drain connection, and drain piping.

E. All system piping shall be seismically braced and restrained in accordance with NFPA 13. This includes restraint of branch lines.

F. Provide listed flexible sprinkler hose connections to supply sprinkler heads in suspended ceiling applications.

1.7 INTENT OF DRAWINGS

A. The Plans may depict the design location of sprinkler heads or piping. These locations may be changed if required to conform to applicable codes. There is no intent by the Owner or his representatives to provide design for any portion of the fire protection systems except for the location of the service entry.

1.8 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturer’s catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Obtain and pay for all permits required for this system. Submit copies for approval.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Make changes requested by the Owner's representative as needed to maintain building esthetics; request prior approval from the Owner's representative should a situation exist that could cause a future problem.
   3. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls. Show seismic protection in accordance with NFPA 13.
   4. Submit shop drawings and hydraulic calculations to Authority Having Jurisdiction for approval. Submit proof of approval to Owner's representative. Provide approved drawings to the Owner's representative for final review. The Engineer will retain one copy of approved drawings.
   5. Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

D. Project Record Documents: Record actual locations of sprinklers and piping. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.9 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Conform to UL and FM requirements.

C. Designer Qualifications: System designer shall hold minimum of NICET Level III certification, and be experienced in the design of this type of work.

D. The installer shall possess a valid State of Washington Fire Sprinkler Contractor's License. Provide a copy with the submittals.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience. Provide written certificate with the submittals.

F. Equipment and Components: Provide products that bear UL, FM, Manufacturer's Logo or Manufacturer's Name, and Country of Origin labels or markings.

G. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.

1.10 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.12 EXTRA MATERIALS

A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet located adjacent alarm valve.

1.13 USE OF THE SYSTEM PRIOR TO COMPLETION

A. Owner reserves the right to order the entire automatic fire sprinkler system or any portion thereof turned on and made operational at any time after installation has been completed sufficiently to permit beneficial use without causing unreasonable delays in contract work. If so ordered, comply within 24 hours after receipt of order. Such use of system by Owner shall not be construed as acceptance of any part of the work, and claims which Owner may have against Contractor shall not be deemed to be waived by such use. The following items shall occur if the system is used prior to completion.
   1. Arrangements for monitoring the system shall be made.
   2. Portions of the system planned for use shall be hydrostatically tested.

3. All parties involved with construction or operation agree to assume responsibility for damage as a result of system leakage which they cause.

1.14 SERVICE AGREEMENTS

A. After completion of fire protection installation and at start of guarantee year, execute National Automatic Sprinkler and Fire Control Association, Inc. Standard Form of Inspection Agreement, or equal, without charge to Owner for four (4) inspections of sprinkler system during guarantee year.

B. During guarantee year, inspections shall be made as per Inspection Agreement, plus the following maintenance is to be performed during the course of fourth inspection:
   1. Operation of all control valves.
   2. Lubrication of operating stems of all interior control valves.
   3. Operation of water motor gong and/or electric alarms.
   4. Cleaning of alarm valves.
   5. Lubrication of fire department hose connection inlets.

1.15 MISCELLANEOUS REQUIREMENTS

A. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products.

B. Verification of Dimensions: The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Owner's representative of any discrepancies before performing work.

C. Welding: Welding shall be in accordance with NFPA 13. Only shop-welded appropriate welding fittings shall be used.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Tyco Fire Suppression & Building Products: tyco-fire.com.
   2. Viking Corporation: vikinggroupinc.com.
   3. Reliable: reliablesprinkler.com
   4. Potter: pottersignal.com
   5. Approved equal.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for the entire building, wet system and/or dry system as indicated on the Plans.

B. Install sprinklers in the top of elevator shafts, at elevator pits, and in elevator machine room. Installation shall be controlled by an isolation valve with tamper switch and water flow switch tied to the Fire Alarm System; install valves in a easily accessible location. Use intermediate temperature heads in these areas.

C. Sprinkler body shall be integrally cast with a hex- or square-shaped wrench boss to reduce the risk of damage during installation. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss.

D. Sprinklers shall not contain rubber O-rings.

E. Occupancy: Comply with NFPA 13. Verify with Plans.

F. Water Supply: Determine volume and pressure from water flow test data provided on the Civil Drawings.

G. Provide fire department connections where indicated.

H. Provide steel storage cabinet for spare sprinklers and tools; locate adjacent alarm valve.

2.3 WET SPRINKLERS

A. Ceiling - Recessed
1. Recessed pendant with matching push-on escutcheon plate.
2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Escutcheon Plate Finish: Chrome-plated.
6. Fusible Link: Glass bulb type, temperature-rated for specific area hazard.
7. Basis of Design: Victaulic Model V27.

B. Exposed - Upright
1. Upright with guard.
2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Fusible Link: Glass bulb type, temperature-rated for specific area hazard.
6. Guard:
   a. Provide where piping is below 7’-0”
   b. Provide in areas where heads are subject to damage
7. Basis of Design: Victaulic Model V27.

C. Sidewall
1. Recessed horizontal sidewall type with matching push-on escutcheon plate and guard.
2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Escutcheon Plate Finish: Chrome-plated.
6. Fusible Link: Glass bulb type, temperature rated for specific area hazard.
7. Basis of Design: Victaulic Model V27.

2.4 DRY SPRINKLERS

A. Ceiling - Recessed
1. Recessed pendant with matching push-on escutcheon plate.
2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Escutcheon Plate Finish: Chrome-plated.
6. Fusible Link: Glass bulb type, temperature-rated for specific area hazard.
7. Provide length as required to suit installation
8. Basis of Design: Victaulic Model V36.

B. Exposed - Upright
1. Upright with guard.

2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Fusible Link: Glass bulb type, temperature-rated for specific area hazard.
6. Guard:
   a. Provide where piping is below 7’-0”
   b. Provide in areas where heads are subject to damage
   c. Finish is to match sprinkler finish
7. Provide length as required to suit installation
8. Basis of Design: Victaulic Model V36.

C. Sidewall
1. Recessed horizontal sidewall type with matching push-on escutcheon plate and guard.
2. Response Type: Quick
3. Coverage Type: As required
4. Finish: Chrome-plated.
5. Escutcheon Plate Finish: Chrome-plated.
6. Fusible Link: Glass bulb type, temperature rated for specific area hazard.
7. Provide length as required to suit installation
8. Basis of Design: Victaulic Model V36.

2.5 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check-type valve with divided seat ring, rubber-faced or aluminum-bronze clapper with elastomer seal, pressure retard chamber, and variable pressure trim to automatically actuate water motor alarm and electric alarm. Include test and drain valve.

B. Water Motor Alarm: Hydraulically-operated impeller type alarm with aluminum alloy red-enameled gong and motor housing, nylon bearings, and inlet strainer. Locate as approved by the Authority Having Jurisdiction. Basis of Design: Victaulic Series 760.

C. Electric Alarm: Electrically-operated red-enameled gong with pressure alarm switch. Coordinate electrical connection with EC. Basis of Design: System Sensor.

D. Water Flow Switch: Vane type switch for mounting horizontally or vertically, with two contacts; rated 15 amps at 125 volt AC and 2.5 amps at 24 volt DC. Basis of Design: System Sensor.

E. Main Alarm Check Valve: For horizontal, vertical, or horizontal and vertical installation, with non-slamming spring-loaded elastomer-faced clapper. Basis of Design: Victaulic Series 751.

F. Automatic Drip Valve: Designed to Underwriter’s Laboratory and Factory Mutual requirements. Brass casting body, stainless steel ball, phosphor-bronze spring, stainless steel retaining ring.

G. Test and Drain Valve: Single-handle ball valve for test function and express drain function, with tamper-resistant test orifice and integral tamper-resistant sight glasses.

H. Main Drain Valve: Nibco or approved equal.

I. Tamper Switch: Supervisory switch, integral to butterfly valves, field-mountable on OS&Y valves.

J. Pressure Switch: Provides a low pressure supervisory signal. Provide explosion-proof switch if required.

K. Flexible Sprinkler Hose Connections for Suspended Ceilings
1. Provide multiple-use flexible piping connections to sprinkler heads in suspended ceilings. All flexible piping systems shall be UL 2443 listed as Flexible Sprinkler Hose with Fittings for Fire Protection Service. Flexible piping systems shall be installed according to their listing.
2. All flexible piping connections to include a fully-welded (non-mechanical fittings), braided, leak-tested, stainless steel sprinkler drop with a minimum internal corrugated hose diameter of 1", or with zinc plated steel 1” NPT Male threaded nipple for connection to branch-line piping, and a one-piece multi-port open-gate ceiling bracket with removable attachment hub and self-securing integrated snap-on clip ends, for attachment to ceiling grid without the need for a screw fastener. The bracket shall allow installation before the ceiling tile is in place.
3. Victaulic Vic-Flex, Flexhead Industries, or approved equal.

L. Fire Department Connections:
1. Type: Free-standing type with ductile iron pipe pedestal and brass hose outlets.
2. Check Valve: For horizontal and vertical installation, with non-slamming spring-loaded elastomer-faced clapper
3. Outlets: Two-way with thread size to suit fire department hardware (by this subcontractor); threaded dust cap, and chain of matching material and finish.
4. Drain: 3/4” automatic drip, outside.
5. Label: "Sprinkler - Fire Department Connection".
6. At the low-point near each fire department connection, install a 90-degree elbow with drain connection to allow for drainage to prevent freezing. Basis of design: Victaulic #10-DR

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Ductwork location shall take precedence over sprinkler piping. General Contractor shall coordinate all subcontractors’ work. Notify the Owner's representative of any irresolvable field issues.

D. Maintain 6'-8" minimum head room in all Mechanical spaces. If minimum spacing is not possible, obtain the Owner's representative's permission, in writing, to install piping at lower heights.

E. Conform to requirements for phased construction, if phasing is required by Owner.

F. Install buried shut-off valves in valve box. Provide post indicator where shown.

G. Provide approved double check valve assembly at sprinkler system water source connection.

H. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

I. Locate outside alarm gong on building wall as indicated.

J. Place piping runs so as to minimize obstruction to other work.

K. Place piping in concealed spaces above finished ceilings.

L. Center sprinklers in two directions in ceiling tile and provide piping offsets as required. Do not install sprinkler heads through or with escutcheon plate covering suspended ceiling grids.

M. Do not install sprinklers that have been dropped or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

N. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

O. Install and connect to fire pump system in accordance with Section 21 30 00, if required.

P. Provide chrome-plated steel escutcheon plates for exposed piping passing through walls, floors, or ceilings. Provide identification of piping throughout building.

Q. Flush entire piping system of foreign matter; have Owner's representative witness flushing.

R. Hydrostatically test entire system. Test shall be witnessed by the Authority Having Jurisdiction and Owner's representative.

S. Inspector's Test Connection and Test Valves:
   1. Provide test connections approximately 6' above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without property damage. Provide discharge orifice of same size as corresponding sprinkler orifice.
   2. Locate test valves such that they are conveniently accessible from the floor. Coordinate locations with the AHJ and Owner. Drips and drains shall be installed for all test valves. All drains shall be piped to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily carry the full flow from each sprinkler drain under maximum pressure. In no case shall a direct connection be made to any sewer system.

T. Installation of Piping
   1. Install accurately cut steel piping to measurements established at the jobsite, free of fins and burrs. Install using full pipe lengths; random pipe lengths jointed by couplings will not be accepted. Clean all piping before placing in position and maintain in a clean condition. Work into place without springing or forcing. Support pipe from structural member only.

2. For pipe joints, provide full cut threads. Apply pipe compound to male thread only. Connect joints so that not more than three threads on the pipe remain exposed.
3. Install grooved couplings in accordance with manufacturer's recommendations.

U. Fire Stopping: Provide approved fire stop materials for all penetrations through fire-rated walls. Maintain wall fire rating.

V. Dirt Legs and Drain Valves: Install approved dirt legs and drain valves at low points of all piping to permit complete drainage of system without disconnection of any piping; drain valves at base of riser to have 1-1/2" hose adapters matching threads of hose systems in the building.

W. Modifications: Install in accordance with approved Shop Drawings. Modifications made to system design or arrangement after approval of drawings by the Authority Having Jurisdiction may only be made after receiving written approval of authority and the Owner's representative; such modifications do not include minor relocations in piping or head placement. Make all revisions in accordance with NFPA 13.

X. Damage During Testing: The Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building, its contents, etc., caused by leaks in any equipment, by unplugged or disconnected pipes, fittings, etc., or by overflow, and shall pay for necessary replacements or repairs to work of others damaged by such leakage.

Y. Supports: Provide pipe/equipment supports and seismic bracing per NFPA 13. The earthquake zone shall be as defined by the IBC.

Z. Test: Test sprinkler piping under hydrostatic pressure of 200 PSI for two-hour period. Prove system watertight to satisfaction of the Owner's representative. Prior to performing tests, notify the Authority Having Jurisdiction and the Owner's representative of the pressure test schedule. All dry fire sprinkling lines shall be drained following initial flow testing.

AA. Provide four hours of instruction to the Owner's personnel at a time acceptable to the Owner. The four hours may be in one session or multiple sessions, and may be added to other Fire Protection Sections for total hours of training available to the Owner.

BB. Posted Instructions: Provide, next to the sprinkler riser main, a printed sheet protected by glass or a transparent plastic cover, giving brief instructions regarding control, emergency procedure, and other data as required by NFPA 13. For hydraulically designed sprinkler system, permanently attach a placard to the riser indicating the location and basis of design (discharge density and system demand).

CC. Approval and Acceptance: After the sprinkler system has been completely installed, pressure tested, drained, and all punch list items corrected, obtain the approval and acceptance of the system by the Authority Having Jurisdiction, in accordance with NFPA 13. Submit the certification of approval and acceptance by the Authority Having Jurisdiction to the Owner's representative.

DD. Identification Signs: Provide per NFPA 13. Attach properly lettered and approved metal signs to each valve and alarm device. Permanently affix hydraulic design data name plates to the riser of each system.

END OF SECTION

SECTION 22 00 10

GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, and Division 01.

B. This section of the specification applies to the entire mechanical work, both interior and exterior, as specified herein after and shown on the plans.

C. This Contractor is responsible for coordination with all other trades.

1.2 SCOPE

A. All services to within five (5) feet of the building shall be provided as shown on plans, and final connections to these services shall be made by the Mechanical Contractor.

1.3 DEFINITIONS

A. The term "approved equal" means final approval by the Owner's representative of a material or piece of equipment substituted for that which is shown in the specifications or plans.

B. The term "provide" means the furnishing and installing of equipment (including connections and appurtenances) complete and ready for use.

C. The terms "Mechanical Contractor (MC)" and "Electrical Contractor (EC)" as used in these Specifications or on the Contract Drawings, refer to those subcontractors working under the direction of the "General Contractor (GC)."

1.4 INTENT OF DRAWINGS

A. The drawings are diagrammatic and do not show the exact details and locations, nor all offsets in piping. Contractor shall provide additional fittings, offsets and extensions in piping and related mechanical insulation as required to meet the intent of the documents and shall include these items in his bid. Contractor shall also include in his bid provisions to relocate or shift piping where conflicts exist with Structural, Architectural or Electrical.

B. Refer to the complete set of Architectural, Structural, Electrical, and Civil Plans and Specifications for additional details of the work. Review Plans and Specifications of other trades to identify other requirements. Discrepancies shall be reported to the Owner's representative immediately before ordering material or beginning work.

1.5 COORDINATION

A. Examine the Architectural, Civil, Structural and Electrical drawings before work is started. Consult with each of the other Contractors regarding locations and spaces required for work and lay out work to avoid interference. Maximum clearance shall be maintained for service access and maintenance of all equipment. Failure to coordinate shall be justification to require Contractor, at his

own expense, to move his work to provide the necessary space for the other contractors.

B. Mechanical systems have space priority as follows, listed with highest priority first: Graded Drainage Piping, then Ductwork, Drainage Vents, Domestic Water Piping, and Fire Protection Piping. MC to make certain that priority access is maintained. This shall be coordinated by the GC and MC without assistance from Owner's representative, Engineer, or Architect.

C. Contractor shall be responsible for his own coordination between all other trades. Development of Shop Drawings shall be a collaborative effort between the General Contractor, Mechanical Contractor, Electrical Contractor and all other subcontractors working on the project. Shifting of piping, ductwork and other mechanical items shall be the responsibility of the Team to maintain the intent of the documents. Submit drawings to the Owner's representative.

1.6 WORK IN OTHER SECTIONS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.7 CODES AND REFERENCES

A. Codes and Standards listed shall be the most current issue as adopted by the Local Jurisdiction. In the event of a conflict of codes, the most stringent code will apply.
   1. International Building Code (IBC)
   2. Uniform Plumbing Code (UPC)
   3. International Mechanical Code (IMC)
   4. Washington State Energy Code
   5. SMACNA Duct Construction Standards, Metal and Flexible
   6. National Electrical Code (NEC)

1.8 PERMITS AND FEES

A. Obtain and pay for all permits, licenses and construction or utility fees. Furnish final certificate to Owner showing compliance with code requirements.

1.9 SCHEDULING

A. Comply with requirements of General Specifications.

1.10 PRIOR APPROVALS

A. Specifications have been written around equipment and material selected for this project based on quality, size, capacity, and performance required to meet building design criteria. Any equipment and/or material used in this project, that is not as specified, must have prior approval from the Owner's representative.

B. Request for Approval must be submitted with substitution request form included in Division 0 to Owner's representative a minimum of 10 calendar days prior to bid date. This letter shall be accompanied with complete information regarding items to be substituted.

C. Those items that receive prior approval will be listed in the Mechanical Addenda.

D. Supplier, and/or Mechanical Contractor, shall be responsible for ensuring that substituted material or equipment is of the same size, quality, capacity, weight,

and electrical characteristics as that specified. Any changes and costs required during construction, due to contractor's/supplier's neglect to properly select substituted equipment, shall be paid by the contractor/supplier.

E. Prior approval to bid does not mean automatic final approval of material or equipment by the Owner's representative. Final approval will be given after final submittal data has been presented to Owner's representative, with complete information regarding weights, capacities, size, electrical requirements and quality.

1.11 MATERIAL AND MATERIAL SUBMITTALS

A. All material used on the project shall be new material and free from defects. This Contractor shall submit catalog data and engineering data, on all equipment as specified or having received prior approval.

B. All Plumbing Fixtures, Trim, Piping and Valves in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

C. Material and equipment specified is designated by various manufacturer's catalog numbers. Acceptable alternate manufacturers are also listed. Such manufacturers are exempt from the 10-day prior approval clause of these specifications, but must submit standard submittal data for final approval as otherwise noted.

D. Submittal shall be arranged in numerical order, according to specification section number and item number. Submittal shall be in PDF format complete with labeled bookmarks (minimum one per specification section)

E. Submittal shall be as follows: Before ordering or installing any of the materials, this Contractor shall submit copies of complete information on the materials to be used on the project. Submittal shall include, but not be limited to, the following.
   1. Contractor's Cost Breakdown.
   2. Complete List of Subcontractors and Suppliers.
   3. Pipe, Valves and Specialties for each system including storm and sanitary drainage systems, domestic water systems, plumbing systems, and all outside systems including fire protection systems.
   4. All Plumbing Fixtures.
   5. All pumps for Plumbing.
   6. Water Heaters.
   7. Insulation.

F. The Owner's representative will return one set of this submittal to the contractor showing any corrections, additions, and/or deletions. This Contractor shall resubmit those items that need to be corrected or added.

1.12 CONTRACTOR'S COST BREAKDOWN

A. Mechanical Contractor shall submit, a cost breakdown of the major portions of his work, pursuant to the following outline.
   1. Job organization and submittals.
   2. Outside site utilities.

3. Plumbing rough-in.
4. Plumbing fixtures.
5. Plumbing piping and insulation.
6. Plumbing specialties - compressed air, hospital gases, shop gases and shop lube.

1.13 RECORD (AS-BUILT) DRAWINGS

A. This Contractor shall maintain a set of Contract Drawings at the site on which the actual installed location of piping, equipment, etc., shall be shown in a legible, neat manner. This set of plans shall show actual dimensions (including depth of bury) of underground piping from construction lines, so they can be readily found after covering. Upon completion of the project, the as-built information shall be transformed into AutoCAD version 2018 or greater. Record drawings shall be the same size as contract drawings. This set of plans shall be submitted for final approval. Drawings shall be one full size set, one half size set and on a USB flash drive in PDF and .dwg format. The contractor shall be ready for review of the on-site as-builts monthly prior to submitting his billing. Failure to have drawings available for review may delay monthly billings.

1.14 OPERATING INSTRUCTIONS

A. Operate all systems through complete cycles in the presence of designated Owner's representative. Give instructions for operation, care and maintenance. All systems shall be operated through complete operating cycles for a minimum period of 7 days in conjunction with the designated Owner's representative before acceptance.

1.15 TRAINING

A. The Mechanical Contractor shall digitally record all Owner Mechanical training sessions and shall provide copies on a USB flash drive. Training sessions shall be provided for all mechanical systems. Three copies shall be turned over to the Owner at the completion of the project.

1.16 OPERATION AND MAINTENANCE MANUALS (O&MS)

A. General: Provide one preliminary searchable PDF set of Operation and Maintenance Manuals including maintenance information and parts list furnished by the manufacturer with the equipment, together with supplementary drawings where necessary, to itemize serving and maintenance points. Include the Valve Tag list(s) as posted in the Mechanical spaces. Include filter maintenance, methods of operation, seasonal requirements, manufacturer's data and warranty forms. Warranty forms are to be located in the front of the manuals as well as in each applicable section. Provide address and 24-hour phone number of the firms responsible under warranty. Items requiring service or correction during the warranty period shall be serviced within 24-hours of notification by Owner. Data in manuals shall be neat, clean copies, with operation and maintenance instructions for each item of equipment installed. Drawings shall be accordion folded. An index shall be provided with all contents listed in an orderly presentation with bookmarks according to specification section.

B. Number of Copies: A preliminary set of the O&M Manuals shall be submitted for approval. After this set has been approved, One hard copy and 3 electronic copies on USB flash drives shall be submitted.

C. Hard Copy Binding: Organize operating and maintenance data into suitable sets of manageable size. Copies shall be submitted in 3-ring binders. Covers shall include the name of the Job, Owner, Architect, Engineer, Contractor, and the year of completion. The back edge of the binder shall include a label with the name of the Job, the Owner and the year completed. Each copy shall have a typewritten index and tabbed dividers between equipment categories. Binders are to be no more than 80% full; binders that are over 80% full will be sent back for dividing into additional binders.

1.17 CERTIFICATIONS

A. Provide written certification that work has been fully completed in strict accordance with Plans and Specifications and request final inspection.

B. Provide written certification that Contractor will replace materials and workmanship that prove defective for one (1) year after date of acceptance or extended warranty as listed in individual sections.

C. Provide written certification of inspection from the Authority Having Jurisdiction, stating that all work has been inspected, accepted, and approved as complying with existing governing ordinances and codes.

D. Provide written certification that Owner's representative has been fully instructed in the operation and function of all mechanical systems.

E. Provide copies of certifications in the O & M Manuals.

1.18 DOCUMENTS

A. Present the following documents to the Owner's representative prior to final acceptance of buildings. Final payment of the Contract will be contingent upon receiving these documents:
   1. Record (as-built) drawings.
   2. Operation and Maintenance Manuals (3 sets).
   3. Final material submittal.
   4. Warranties and Extended Warranties.
   5. Approved Final Balancing logs. .
   6. State of Washington certification of all pressure vessels installed on the project. Affix a copy to each tank.
   7. Final certificates of inspection and code compliance.
   8. Domestic water test results.
   9. RPBF device tests.
   10. All applicable forms required by these specifications.
   11. Provide copies of the above documents in O & M Manuals.

1.19 WARRANTY

A. All Plumbing systems, and all parts thereof, shall be warranted (parts and labor), for a period of one (1) year after the date of substantial completion as determined by the documentation.

B. Contractor shall repair or replace, to the satisfaction of the Owner's representative, any defective material, equipment, or poor workmanship which may show itself during this warranty period.

C. Test and Balance shall be warranted for two (2) years total, from date of final acceptance.

1.20 MECHANICAL ACOUSTICAL REQUIREMENTS

A. The noise criteria (NC) end resultant for each space shall be per Code, as accepted by Local Jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUBMITTAL

A. Owner's representative's review of submittals is for general conformance with the design concept and Contract Documents. Marking or comments shall not be construed as relieving the Contractor from compliance with the project Plans and Specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy for confirming and correlating all quantities and assembly and for safe performance of his work.

END OF SECTION

SECTION 22 00 20

BASIC MATERIALS AND METHODS FOR PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. General requirements for basic materials and methods.

1.2 REFERENCES

A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

B. "Seismic Restraint Manual Guidelines for Mechanical Systems" by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

PART 2 - PRODUCTS

2.1 GENERAL

A. See specific sections for this requirement.

2.2 PRODUCT TESTING

A. Any piece of equipment used in this project and hereinafter specified which, by its nature, requires electrical connection, such as pumps, water heaters, booster heaters, etc., must be provided with an approval label from one of the agencies hereinafter listed.

B. Approval of agency must be for the total package (approval of individual components not acceptable). All labels must be located outside of equipment and shall be visible to inspector. Comply with all requirements of RCW 19.28.010 and NEC Sections 90-7 and 110-3 (1993).

C. It is the responsibility of the Mechanical Contractor or the equipment supplier to meet the requirements of this section. Any agency costs to provide appropriate label for a piece of equipment must be included in this bid. Failure by Mechanical Contractor or supplier to obtain approval labels prior to bid shall be sufficient cause for the Mechanical Contractor/supplier to obtain all such labels at no additional cost to Owner. The following is a list of approval testing laboratories:

1. Underwriters Laboratories, Inc., www.ul.com
2. Canadian Standards Association, www.csagroup.org
3. American Gas Association, www.aga.org
4. Factory Mutual Systems, www.fmglobal.com
5. MET Electrical Testing, www.metlabs.com
6. Intertek Testing, www.intertek.com

2.3 PRESSURE VESSELS

A. At the completion of the project, the Contractor shall provide State of Washington Certification of all pressure vessels installed on the project. Affix certification on the vessels and provide a copy in the O&M Manual.

2.4 DAMAGED OR REJECTED MATERIALS

A. Remove from the site immediately.

2.5 FIRE INTEGRITY - PENETRATION SEALING SYSTEMS

A. Manufacturers
   1. 3M Fire Products
   2. Holdrite
   3. Approved equal

B. The penetration sealing systems shall be provided with F-Rating and/or T-Rating as required by IBC Section 714.3 and 714.4. Penetrations include the following:
   1. Through-penetration firestopping in fire-rated construction.
   2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction.
   3. Construction-gap firestopping occurring within fire-walls, floor or floor-ceiling assemblies.
   4. Construction-gap firestopping in smoke partitions.
   5. Through-penetration smoke stopping in smoke partitions.
   6. Construction-gap smoke stopping in smoke partitions.
   7. All and piping penetrating mechanical spaces, mechanical mezzanines, mechanical lofts, mechanical boiler rooms, or other mechanical spaces, shall be fire caulked, even if the walls are not rated. Visible piping penetrations shall be covered by split chrome-plated floor and ceiling plates.

C. All products shall be listed in Underwriters Laboratory Fire Resistance Directory.
   1. Through-penetration firestop devices (XHCR).
   2. Fire resistance ratings (BXUV).
   3. Through-penetration firestop systems (XHEZ).
   4. Fill, void or cavity material (XHHW).

D. All material shall be tested per American Society for Testing and Material Standards, ASTM E814: Standard test method for fire tests of through-penetration firestops.

E. Firestopping for penetrations and voids shall be UL-tested systems.

2.6 HANGERS

A. Manufacturers:
   1. Grinnell
   2. Michigan Hanger
   3. Tolco
   4. PHD
   5. Anvil
   6. Holdrite
   7. Approved equal

B. Provide all anchors, hangers and all supports for piping and equipment included in contract.

C. It is the responsibility of the Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard, commercially-accepted pipe hangers and accessories.

D. All pipe hangers and supports shall conform to the latest requirements of ASME B31.1 Code for Pressure Piping , and Manufacturers Standardization Society Documents MSS SP-58 and MSS SP-69.

2.7 INSERTS AT HANGERS AND SUPPORTS

A. Manufacturers:
1. Holdrite
2. Buckaroos
3. Cooper
4. Metro Supply Company
5. Value Engineered Products, Inc.
6. Hydra-Zorb Klo-Shure 7-series or 8-series strut-mount and Clevis
7. Approved equal

B. Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. The insert is to consist of either hydrous calcium silicate or polyisocyanurate foam insulation (urethane) encircling the entire circumference of the pipe with a 360-degree PVC (1/16” thick) or galvanized steel jacket (20 gauge minimum). Inserts are to be installed on piping during piping installation, by the Piping Contractor. Provide continuous insulation vapor barrier. Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor retarder mastic.

C. For elastomeric insulation, provide Hydra-Zorb Klo-Shure 7-series 8-series strut-mount or Clevis Hanger Insulation Couplings or approved equal.

D. Insulation and covering shall meet the flame spread index and smoke developed index as noted in the International Building Code.

E. Insert thickness shall match Code-required insulation thickness as a minimum.

F. Provide pipe covering protection saddle for piping on rollers; Anvil figure 160 through 166A or approved equal.

G. Inserts for piping in plenums shall have appropriate flame/smoke spread rating.

2.8 ACCESS DOORS AND PANELS

A. Manufacturers:
1. Jay R. Smith
2. Milcor
3. Mifab
4. Approved equal.

B. 16 gauge steel door and frame with concealed hinge and cylinder lock. Provide matching latches/locks keyed the same for multiple panels in a project. When "B" dimension is 24" or more, provide additional latches at the top and bottom of door. Provide finish and material as noted in Part 3 – Execution.

2.9 CONCRETE INSERTS

A. Manufacturers:
1. Grinnell
2. Kinsdorf
3. Elcen
4. Approved equal.

B. Inserts in concrete for the suspension of piping and equipment shall be provided by this Contractor, unless otherwise noted on the Plans. Inserts in "poured-in-place" concrete shall be Grinnell 282 galvanized, or approved equal.

2.10 VIBRATION AND SEISMIC CONTROLS

A. Manufacturers:
1. Kinetics Noise Control, Inc.
2. Mason Industries
3. Amber-Booth
4. I.S.A.T.
5. Flexicraft
6. Twin City Hose
7. Approved equal.

B. General
1. If equipment is internally isolated by the manufacturer, internal isolation (base and isolator) shall be equivalent to the scheduled base and isolator and the isolator shall meet the scheduled spring static deflection.
2. Size anchoring bolts to withstand lateral seismic shear and isolate bolts from direct contact with structure using bolt isolation washer and bushing.
3. Bases specified in the schedule can be supplied by the manufacturer of the equipment if they meet the specification given herein.
4. Electrical connections shall be made with floppy length of flexible cable.
5. Piping in connected to vibrating equipment shall be supported from resilient ceiling hangers or from floor mounted resilient supports.

C. Pipe Isolation - General
1. Hung Type Isolators: Double-Deflection Neoprene Hanger to 4", Deflection - 30 degree Swing Spring and Double Deflection Neoprene Hanger - 6" and larger.
2. Isolator Deflection: 1/4” to 4", 1" - 6" and larger.
3. Motion Restraint Snubber: seismic restraint cable, rod clamp for standard 1-5/8" x 1-5/8" unistrut, and clevis cross brace.

D. Piping not requiring sway bracing is as follows:
1. Piping in mechanical spaces less than 1".
2. All other piping less than 2-1/2".
3. Piping suspended by hangers 12" or less in length measured from the top of the pipe to bottom of hanger support where the hanger is attached.

E. Pumps
1. Flex Connector: Flexible Pipe Connection.
2. Provide seismic restraint cable for inline pumps.

2.11 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

A. Where non-metallic piping is buried, provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3" minimum width, color-coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "Caution: Buried Water Piping Below" or similar wording.

Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

A. Locate all general reference points as established by the General Contractor and take such action as is necessary to prevent their destruction; lay out work and be responsible for all lines, elevations, grading for utilities and other work executed under the Contract. Exercise proper precautions to verify figures shown on drawings before laying out work, and be responsible for any errors resulting from failure to exercise such precaution. The coordination of the utility installation with the final site grading and elevation by the General Contractor shall be the responsibility of this Contractor. Locate existing utility lines which will be affected by the building location before any footing work begins. Report conflicts with the Plans to the Owner's representative for adjustment before proceeding with the work. Failure to follow this instruction will result in the Contractor being required to alter his work at his own expense.

3.2 ELECTRICAL WORK

A. All electrical work performed under this Section of the Specification shall conform to all applicable portions of the Electrical section of the Specifications, and shall conform to all applicable Codes.

3.3 WORKMANSHIP

A. Furnish and install all equipment for a neat and finished appearance. If, in the judgment of the Owner's representative, any portion of the work has not been installed in a workmanlike manner, or has been left in a rough, unfinished manner, Contractor will be required to remove and reinstall the equipment, and patch and paint surrounding surfaces in a manner satisfactory to the Owner's representative, without any increase in cost to the Owner.

3.4 EXCAVATION - GENERAL

A. Perform all necessary excavation, shoring and backfilling required for the proper installation of work inside the buildings and premises, or outside as may be necessary. Slope sides of excavation to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Sewer trenches shall be excavated to the grade with the bottom rounded to the outside of the sewer piping. Bell holes shall be hand excavated to ensure that piping rests for its entire length upon the bottom of the trench.

B. Excess excavation shall be backfilled with gravel or sand and mechanically compacted to give full support to the piping. In case of sewer lines in rock excavation, the excavation shall be made at least 6" deeper than required and backfilled with sand to outside invert grades to provide cushion. No underground lines shall be covered until the installation has been approved by the Owner's representative and the Authority Having Jurisdiction. Maintain sides and slopes

of excavations in safe condition until completion of backfilling. All backfill shall be thoroughly compacted.

C. No cinders shall be used for backfilling where steel, iron or copper piping is used. All trenches near or under footings shall be cut only after approval of the Owner's representative, and all backfilling of such trenches shall be according to his direction.

D. All items of grading which will in any manner affect the bearing capacity of the soil foundations upon which will be placed floor slabs, walls, column footings or pipe beds shall be performed to the satisfaction of the Owner's representative. All soil foundation areas which will in any manner support any of the above-stated construction will be compacted by the use of mechanical tampers to at least 95% of the maximum density of the soil foundations as determined by the compaction control test, in accordance with the "Method of test for Moisture Density Relations of Soils, ASTM Designation D1557." The moisture control at the time of compaction shall be uniform throughout the area and shall not vary more than 5% above or below the optimum moisture content as determined by the above described " Compaction Control Test." Place fill in 8" loose layers, each layer compacted.

3.5 EXCAVATION DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations, and from a flooding project site and/or surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions, outside excavation limits to convey rain water and water removed from excavations to collection points or run off areas. Do not use trench excavation as temporary drainage ditches.

3.6 EXCESS EXCAVATION MATERIAL

A. Dirt and debris from trench excavation shall be disposed of by this Contractor, as directed by the Owner's representative.

3.7 PIPING INSTALLATION

A. Lay piping in straight lines with uniform slope, leave no pockets. Care shall be taken to keep all foreign materials out of the piping during installation. Where ground water is present, provide suction pumps to keep trenches free of water, and cap ends of piping exposed to ground water when work is interrupted.

B. All underground piping used for the distribution of domestic water systems and waste drainage systems located outside the building perimeter shall be buried a minimum of 36" from finish grade to top of piping.

C. Piping run above the floor SHALL NOT BE LOCATED OVER ELECTRICAL PANELS OR SWITCHBOARDS, except where located above a structural ceiling, or with drain pans approved by the AHJ. This piping includes, but is not limited to, waste and vent and domestic water lines.

D. All piping SHALL BE ROUTED AROUND Elevator Equipment Rooms unless placed above a structural ceiling. Piping may serve the room, but may not pass through it. Follow all codes applicable to these areas.

E. Isolation Valves:
1. Provide isolation valves on inlets and outlets of all major pieces of equipment, to facilitate serving and removal of such equipment without the necessity of draining the associated system. Provide whether or not shown on Plans.
2. Provide isolation ball or butterfly valves with positive shutoff for all hot water, cold water and hot water recirculation piping serving public restrooms.
3. Provide isolation ball or butterfly valves at all branches off the mains.
4. Isolation valves shall be located above T-Bar ceiling where possible.
5. Provide access panels to isolation valves located above hard ceilings.

F. Circuit balance valves: Hot water recirculation lines are to have a circuit balance valve at each branch and restroom in addition to the isolation valve. Provide whether or not shown on Plans.

G. Do not solder within 12” of valves, flanges, etc., manufactured from any bismuth alloy.

3.8 OPENINGS IN PIPING

A. Keep all openings covered tightly with plastic during the work.

3.9 PIPE SLEEVES

A. General: Provide pipe sleeves for piping passing through foundations, walls, floors, partitions, and roof to allow piping to pass freely through.

B. Foundation Walls: Where piping passes through walls below finished grade, but does not enter the building spaces, the sleeves shall be Schedule 40 galvanized steel pipe. Provide a modular seal between the sleeve and the piping.

C. Building Walls (Below Grade) and Floor Slabs: Where piping passes through building walls below grade, and floor slabs on grade or below grade, the sleeves shall extend a minimum of 1" inside the building wall or above the finished floor level, and shall be made watertight and gas tight by the appropriate modular seal. Sleeves shall be Schedule 40 galvanized steel pipe. If the sleeve and modular seal are subject to trapping water on the top side, pack with water resistant foam and caulk with flexible caulking or grout.

D. Building Walls and Floor Slabs (Above Grade) - New Construction: Where domestic hot and cold water and hot water circulation piping passes through concrete walls or floors within the building, the sleeves shall be of sufficient strength to withstand the pressure and concrete pouring operation without deforming or rupturing. Sheet metal ductwork with end slit and formed into flanges is not acceptable. Sleeves shall extend 1" above the finished floor. Sleeves in walls shall be flush on both sides.

E. Piping Subject to Expansion: Where piping is subject to motion due to expansion, such as domestic hot water piping, the sleeve shall be made large enough to allow free motion. When piping passing through is insulated, the sleeve shall be large enough to permit the covering to pass through.

3.10 WALL/FLOOR PLATES AND ESCUTCHEONS

A. Where piping passes through any wall, floor or ceiling, it shall be fitted with chromium-plated steel escutcheons, with suitable set screws or other approved holding device. Where extended sleeves are necessary, the plates shall be of sufficient depth to cover the sleeves.

3.11 CONCRETE INSERTS

A. Inserts shall be installed in forms as work progresses.

B. See structural detail for hangers in pre-cast floor panels system.

3.12 PIPE HANGERS AND SUPPORTS

A. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger location, in order to prevent excessive stress in either pipe or equipment connections.

B. Where piping is to be supported from building steel, beam clamps shall be used. Beam clamp selection shall be for the required load and the configuration of the steel at the point of attachment. Drilling holes in the steel for hanger rod will not be permitted unless approved by the Structural Engineer. Use only adjustable side beam clamps (Type 25); standard beam clamps are not acceptable.

C. Riser Clamps (Vertical Piping): Piping shall be supported at each floor with a riser clamp or at sufficient intervals to carry the weight of the piping and its contents. Stacks shall be supported at their base by a concrete pier or by a suitable hanger located on the horizontal run, close to the riser. Riser clamp extensions shall rest on the building structure where possible; auxiliary steel supports shall be provided where it is impractical to rest directly on the building structure.

D. Angle Clips: Where piping is to be supported from building wood structure, angle clips shall be used with lag bolts sized to support the load in shear. Any attachment to wooden structural members shall be subject to the approval of the Structural Engineer.

E. Hanger Rods: Hanger rod size shall be selected on the basis of loading from the following table:

3/8"	610#
1/2"	1,130#
5/8"	1,810#

F. Hangers shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing. DO NOT BEND RODS.

G. All rods shall be electro-plated to prevent corrosion.

H. All rods shall be double-nutted, on both ends if applicable, and excess rod on the bottom shall be cut flush and ground for safety.

I. Hanger Spacing: The maximum allowable spacing for pipe hangers shall be in accordance with the following. Where concentrated loads of valves, fittings, etc.,

occur, closer spacing will be necessary and shall be based on the weight supported and recommended loads for the hanger components.

1. Spacing:
   a. Cast Iron Hubless - Shielded Coupling:
      1) Horizontally: Every other joint, unless over 4', then support each joint. See notes 1, 2, 3, and 4.
      2) Vertically: Base and each floor not to exceed 15'.
   b. Copper Tube and Piping - Soldered, Brazed or Welded.
      1) Horizontally: 1-1/2" and smaller, 6'; 2" and larger, 10'.
      2) Vertically: Each floor, not to exceed 10'. See note 5.
   c. Notes For Above:
      1) Support adjacent to joint not to exceed 18".
      2) Brace at not more than 40' intervals to prevent horizontal movement.
      3) Support at each horizontal branch connection.
      4) Hangers shall not be placed on the coupling.
      5) Vertical water lines may be supported in accordance with recognized engineering principles with regard to expansion and contraction when first approved by the Authority Having Jurisdiction.
      6) See the appropriate IAPMO Installation Standard for expansion and other special requirements.

J. Hangers - Horizontal Piping:
1. General: All hangers shall be provided with means of vertical adjustment. The following schedule shall be followed to select acceptable hangers for the type of service.
   a. Insulated Copper Piping:
      1) Adjustable steel Band Hanger with Shield.
      2) Clevis hanger with Shield.
   b. Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. See paragraph “Inserts at Hangers and Supports” in this Section.
2. Roller Hangers: Provide roller hangers for all applications where thermal movement causes hanger rods to deviate more than 4 degrees from vertical, or where longitudinal movement exceeds 1/2". Provide roller hangers used in conjunction with protection saddles to suit the insulation thickness.
3. Trapeze Hangers: Where piping is grouped in parallel, provide manufactured strut or trapeze hangers consisting of two steel angles bolted back to back, with space between for a hanger rod at each end. Where the length of angles is greater than 24", there shall be three rod supports. Piping shall be able to move independently, and hanger spacing shall be dictated by the smallest pipe.
4. Brackets and Racks: Where piping is run adjacent walls or steel columns, welded steel brackets shall be used as base supports. Multiple pipe racks or trapeze hangers shall be designed and fabricated to suit conditions.
5. Vibration Control: Provide a vibration control hanger for all piping within a mechanical room and at the first three hanger locations from any motor-operated equipment. Hanger shall consist of steel frame and spring, with neoprene washers.

6. Anchors, Guides and Sliding Supports: Shall be as shown on the drawings or as necessary to prevent excessive stress in either piping or equipment.
7. Auxiliary Steel: All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC Steel Handbook, furnished by the Mechanical Contractor, and shall receive one shop coat of primer paint.
8. Submittals: The Contractor shall submit, prior to installation, the following information and data for approval.
    a. Data Sheets on all cataloged items to be used.
    b. Sketches covering all specially designed hanger assemblies and fabrications.

3.13 CUTTING AND PATCHING

A. Furnish dimensions and locations of openings to other Contractors doing the work. Provide ample time to avoid delays and unnecessary labor. Cutting and patching made necessary to admit work, repair defective material or workmanship, or by neglect to anticipate proper requirements, shall be done by the General Contractor. at the expense of the Mechanical Contractor.

3.14 ACCESSIBILITY

A. Locate valves, traps, damper operators, etc., so as to be easily accessible in mechanical spaces or through access panels, specified hereinafter. Otherwise, obtain Owner's representative's approval of location.

B. Any equipment requiring maintenance clearances for servicing of filters, motors, compressors, etc., shall be carefully coordinated to avoid servicing problems. Failure of Contractor to comply with this requirement shall be sufficient cause for Contractor to make all necessary changes at no cost to the Owner. To avoid problems with interpretation of the NEC, allow 42" for all electrical clearances.

3.15 ACCESS DOORS AND PANELS

A. Locations of panels shall be carefully selected during construction, so as not to be located behind cabinets, etc. Coordinate closely with the Architectural and Electrical Plans before installing panels.

B. In areas such as janitor's room or on painted walls, etc., access panels shall be prime-coated and painted by the General Contractor; install before surrounding surfaces have been painted. In areas such as toilet rooms, the access panels shall be stainless steel or chrome-plated. In other finished areas such as on ceilings, all access panels shall have the same type of finished surface as that of the surrounding area.

C. Verify with the Owner's representative location and finish prior to ordering; failure to get the Owner's representative's approval may result in replacement of access panels at the Mechanical Contractor's expense. Minimum size of access doors is 12" x 12"; actual size depends on the specific circumstance, and panel shall be large enough to accomplish replacement or repair of the item requiring access. The Owner's representative shall have the final say on whether or not the access is of sufficient size.

D. Provide access panels for all wall cleanouts on drainage piping and concealed valves for all piping.

E. Doors shall have cylinder lock latches, all keyed alike.

F. Provide fire-rated access doors for one-hour or two-hour rated walls and ceilings; units shall be UL labeled.

3.16 MECHANICAL ACCESSES

A. Provide suitable access to all mechanical equipment requiring servicing, maintenance, replacement, or repair. In concealed spaces where access has not been provided by the Architect by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the Owner's representative, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades, to avoid conflict therewith, and such locations shall be approved by the Owner's representative prior to installation of access panels.

3.17 PAINTING, TAGS, ETC.

A. Field painting of all equipment, piping etc., located in and exposed in occupied spaces, shall be by the General Contractor. See Architectural painting specification.

B. Identification Tags: Provide identification tags for each main shut-off and control valve throughout the building indicating the system served. Tags shall be black phenolic plastic with white engraved inscription attached with chrome chain.

C. Each major item of Equipment shall be provided with the name of the item, i.e., Water Heater No. 1, etc., in labels of black phenolic plastic with white engraved inscription. Minimum size of lettering is 1" with a maximum of 2". Select appropriate sizes for the size of the equipment being labeled. Align labels with edges of equipment and locate labels so as to be visible.

D. Pipe Markers:

1. Piping throughout the building shall be equal to Brady Corporation No. B-946, M.S.I. No. MS-900, meeting or exceeding ANSI A13.10-1981. Pipe markers shall consist of two wraps of arrows in the direction of flow, color, and wording as indicated in the following schedule. Stencils shall be visibly located and spaced on maximum 20'-0" centers for long straight pipe runs. Stencils shall be located on both sides of a wall, within the first 3'.

2. Color Code Schedule: (Service, Color, Stencil)

Domestic Cold Water	Green C.W.
Domestic Hot Water	Yellow H.W.
Domestic Hot Water Recirc.	Yellow H.W.C.
Waste and Vent Lines	Yellow D.W.V.

3.18 TEST PLUGS AND GAUGES

A. Pressure or temperature test plugs shall be installed on inlet and discharge of all pumps, coils, boilers and other hydronic equipment, even if they are not shown on Plans.

B. Pressure or temperature test plugs shall be installed adjacent all temperature and/or pressure sensors, even if they are not shown on Plans.

C. A minimum of six (6) compatible pressure gauges (including pressure gauge adapters) and six (6) compatible temperature gauges shall be provided.

D. P&T test plugs included on other devices that serve the same purpose and that provide the same information are acceptable; duplicates are not required.

3.19 FIRE INTEGRITY

A. All penetrations of fire-rated walls, ceilings, roofs or floors by piping must be protected by appropriately-rated assemblies and caulking to maintain integrity of structure.

3.20 CLEANING UP

A. Comply with requirements of the General Specifications.

B. Remove tags, labels, etc., from all plumbing fixtures. Clean all fixtures and trim.

3.21 CAULKING

A. Caulk all openings and flash around all piping and equipment passing through roof, floor, and walls. All caulking shall be water resistant. See also Paragraph "Fire Integrity" for rated wall, ceiling, roof, or floor penetrations.

B. All piping penetrations of walls, ceilings, and floors shall be caulked. A chrome-plated steel escutcheon plate shall be installed at each visible pipe penetration of walls, ceilings, or floors.

3.22 OPERATION OF EQUIPMENT AND SYSTEMS

A. Contractor is responsible during all periods of balancing and testing. Provide temporary utilities as required.

3.23 TESTS, ADJUSTMENTS AND INSPECTION

A. Test all work thoroughly and systematically, both during construction and after completion. Notify Owner's representative 48 hours in advance of all tests. Tests shall be maintained until approved. Tests shall be as hereinafter specified.

B. The Contractor shall test the completed installation as in regular service. Any defects or imperfections that may show up are to be promptly corrected. The Contractor shall guarantee the entire system and all parts thereof for a period of one year from date of final acceptance. The Contractor shall repair or replace any part which may show signs of failure during that time, if such failure, in the opinion of the Owner's representative, is due to imperfections in material or to improper workmanship.

C. No system, whether prescribed for testing or not, shall be covered or concealed below ground, in walls, in ceiling spaces, or generally from ease of viewing, without first notifying the Owner's representative. Failure to notify the Owner's representative for inspection of concealed systems shall be cause to require this Contractor to uncover and recover such systems at no additional cost.

D. A log of all tests shall be kept. The log shall note dates, time of day test started, system or portion of system tested, length of test, test results, and who witnessed the test (AHJ, Owner's representative, or GC). Contractor shall include legible names of witnesses. Contractor to submit a copy of the contractor's test log monthly to the Owner's representative.

E. Review the project to determine when final inspection is appropriate and advise Owner's representative. Mechanical Contractor is required to complete his work before requesting final inspection.

F. See specification section of piping used for test methods or procedures used.

3.24 FINAL INSPECTION

A. This Contractor shall thoroughly review and inspect the project to determine when final inspection is required, and shall so advise the Owner's representative. It shall be understood that the work is to be essentially complete. If such is not the case and more than one final inspection and one backcheck are necessary, this Contractor may be billed for the additional back checks at the then governing rate for the personnel involved. The final inspection punchlist shall be legibly signed on a copy of the punch list by a person responsible for the trade involved, and transmitted to the Owner’s representative, before the backcheck will be scheduled.

3.25 PROTECTION AND CLEANING

A. All equipment and material installed by this Contractor shall be properly protected from damage during the course of construction. Enamelware or china fixtures which are plastered around and/or over shall be protected with heavy, thoroughly-secured, wrapping paper. All fixtures and equipment shall be thoroughly cleaned before final inspection. Remove all pasted paper labels from plumbing fixtures.

B. In attic or other spaces where piping such as domestic water lines, etc. have been installed at floor level and interfere with foot traffic, the Mechanical Contractor shall provide covers to protect these pipes. Wood or other such material will be acceptable.

C. Provide and protect walking paths in mechanical spaces. Maintain 6'-8" headroom for all piping. If required clearance is not possible, obtain permission from the Owner's representative to violate the above requirement, and comply with protective measures required.

3.26 SPECIAL PROTECTION

A. Exercise maximum precaution to protect the building and equipment from damage of any kind, and in particular, prevent water and dust seepage into new equipment.

3.27 BALANCING WORK

A. Provide Testing, Adjusting and Balancing as required in this section of the specification.

3.28 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

A. Scope: Following installation of mechanical work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner's representatives.

B. General Description of Instruction Periods: Each period shall include preliminary discussion and presentation of information from maintenance manuals with

appropriate references to drawings, followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures, settings, and available adjustments.

C. Scheduling of Instruction Periods: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given to the Owner's representative at least two weeks prior to the instruction periods, and agreement reached as to the date at which the instruction periods are to be performed. Advise Owner's representative two weeks prior to date when ready to conduct instruction and demonstrations; receive approvals of proposed date prior to making final arrangements.

3.29 ON-SITE OBSERVATIONS AND SAFETY MEASURES

A. During its progress, all work shall be subject to observation by the Owner's representative, and of the National Board of Fire Underwriters, State and Local Inspectors. The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The Contractor will be totally responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Owner's representative to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. It shall be the Contractor's responsibility to comply with "Safety and Health Regulations for Construction" in the Federal Register by the U.S. Department of Labor. Contractor shall be responsible for providing all such safety measures and shall consult with the State and/or Federal Safety Inspector for interpretation whenever in doubt as to whether he is or is not in compliance with State and/or Federal regulations. Furthermore, the Contractor distinctly assumes all risk or damage or injury to any persons or property wherever located resulting from any action or operation under this contract or in connection with the work.

3.30 DRAFT STOPS

A. It shall be the responsibility of each Contractor performing his trade to verify with Architectural Plans and to maintain the integrity of draft stops, whenever his work requires penetration of these areas. Patch as required to maintain integrity of draft stops.

3.31 COMMISSIONING

A. This Contractor will be required to participate in the commissioning process. The Mechanical Contractor shall complete the start-up forms and shall complete the commissioning process. The Mechanical Contractor shall include in his bid all cost associated with his portion of the commissioning process. The

B. The following Mechanical Items shall be commissioned.

1. Water heaters
2. Hot water recirculation systems

END OF SECTION

SECTION 22 05 16

PIPING EXPANSION COMPENSATION - PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flexible Pipe Connectors - Copper Piping

B. Pipe loops.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

1.3 SUBMITTALS

A. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

B. Design Data: Indicate selection calculations.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

1.4 REGULATORY REQUIREMENTS

A. Conform to UL requirements.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:
   1. Flex Hose, Inc.
   2. Metraflex Company
   3. Approved equal.

B. Inner Hose: 321 Stainless Steel.

C. Exterior Sleeve: 304 Single braided, stainless steel.

D. Pressure Rating: 125 psi and 450 degrees F.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4" one each side of installed center line.

2.2 PIPE EXPANSION LOOPS

A. Manufacturers:
   1. Tri-Flex Loop by Flex Hose, Inc.
   2. Metraloop by Metraflex Company.

3. Approved equal.

B. The two approved manufacturers are slightly different in their installation methods. Contractor is to make a choice and install a complete system; there will be no extras due to the differences.

C. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
   1. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
   2. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.
   3. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged or welded end connections.

D. Usage: On piping at building expansion joints, and for pipe expansion and contraction due to system layout. Manufacturer is to prepare a piping layout showing best location of expansion loops, nesting of loops, anchors, seismic restraint, and recommended pipe hanging method. This information is to be submitted for approval. Contractor is responsible for a complete system based on actual pipe routing, materials, and actual expansion joints used.

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:
   1. Steel Shapes and Plates: ASTM A 36/A 36M.
   2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
   3. Washers: ASTM F 844, steel, plain, flat washers.
   4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened Portland cement concrete, with tension and shear capacities appropriate for application.
      a. Stud: Threaded, zinc-coated carbon steel.
      b. Expansion Plug: Zinc-coated steel.
      c. Washer and Nut: Zinc-coated steel.
   5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened Portland cement concrete, with tension and shear capacities appropriate for application.
      a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
      b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
      c. Washer and Nut: Zinc-coated steel.

2.4 PIPING LAYOUT

A. Manufacturer is to prepare a piping layout showing best location of expansion loops, nesting of loops, anchors, seismic restraint, and recommended pipe hanging method. This information is to be submitted for approval.

2.5 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

F. Should expansion exceed 1" due to thermal expansion or contraction, piping shall be installed on roller hangers. Do not restrict loop movement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide Flexible Piping Connections, when equipment being connected to is isolated. This section covers flexible piping connectors for reasons other than noise and equipment Isolation.

B. Install in accordance with manufacturer's instructions.

C. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on coil connections or apparatus.

D. Provide support and equipment required to control expansion and contraction of piping. Provide flexible connectors, pipe expansion loops, and pipe offsets as required. Piping expansion compensation system is not show on the drawings. Contractor is responsible for a complete piping system.

END OF SECTION

SECTION 22 05 19

AND METERS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Positive Displacement Meters (liquid)
B. Residential Sub-Meters
C. Pressure Gauges
D. Pressure Gauge Accessories
E. Stem Type Thermometers
F. Test Plugs

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Domestic Water Piping

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers.
B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; The American Society of Mechanical Engineers.
C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.
D. AWWA C700 - Cold Water Meters -- Displacement Type, Bronze Main Case; American Water Works Association; (ANSI/AWWA C700).
E. AWWA C701 - Cold Water Meters -- Turbine Type, for Customer Service; American Water Works Association.
F. AWWA C702 - Cold Water Meters -- Compound Type; American Water Works Association.
G. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.6 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 - PRODUCTS

2.1 POSITIVE DISPLACEMENT METERS (LIQUID)

A. Manufacturers:
1. Sensus Metering Systems
2. Badger
3. Approved equal

B. Meter: Brass body turbine meter with magnetic drive register.
1. Service: Cold water, 80 degrees F.
2. Accuracy: 1-1/2%.
3. Maximum Counter Reading: 10 million gallons.
4. Size: As shown on the Plans.
5. Provide a pulser compatible to EMCS.

2.2 RESIDENTIAL SUB-METERS (alternate bid item)

A. Manufacturers:
1. NMT Versamag
2. Master Meter
3. MTW MJ20/MJ420
4. Approved equal.

B. Meter
1. AWWA C708
2. NSF-61-G
3. Magnetic Drive: Dry meter counter does not come into contact with water.
4. Multi-jet impeller with magnetic transfer between the impeller and counter index.
5. Pulse output
6. Provide complete system with remote monitoring. System shall be remotely read in the mechanical room. Contractor to provide system complete with wiring.

2.3 PRESSURE GAUGES

A. Manufacturers:
1. H.O. Trerice Co.
2. Weiss Instrument, Inc.
3. Weksler Instrument Co.
4. Approved equal

B. Gauge: ASME B40.1, stainless steel case, phosphor bronze tube, rotary brass movement, brass socket, black scale on white background.
1. Case: Drawn stainless steel, with stainless steel ring.
2. Window: Lexan or acrylic.
3. Size: 4-1/2" diameter.
4. Mid-Scale Accuracy: 1% middle half of range, 2% of full range.
5. Scale: Psi.
6. Range: Contractor to select operating pressure near middle of range. Provide combination scale for pump suction applications.

2.4 PRESSURE GAUGE ACCESSORIES

A. Needle Valve: Brass, 1/4" NPT for minimum 150 psi. Usage: all projects.

B. Pulsation Damper: Pressure snubber, brass with 1/4" connections.

2.5 STEM TYPE THERMOMETERS

A. Manufacturers:
1. H.O. Trerice Co.
2. Weiss Instrument, Inc.
3. Weksler Instrument Co.
4. Approved equal

B. Thermometers - Fixed Mounting: Blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish.
1. Size: 9" scale.
2. Case: Cast Aluminum, no plastic case.
3. Window: Clear Lexan or acrylic.
4. Fill Type: Blue colored, spirit, organic.
5. Mercury fill is not acceptable.
6. Stem: 3/4" NPT with 3-1/2" standard brass socket.
7. Accuracy: 1%.
8. Calibration: Degrees F.

2.6 TEST PLUGS

A. Test Plug: 1/4" or 1/2" brass fitting and cap for receiving 1/8" outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2" diameter pressure gauge, one gauge adapter, with 1/8" probes, two 1" dial thermometers. Provide one Test Kit for Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide three pressure gauges per pump, installing taps before strainer or suction diffuser and on suction and discharge of pump. Pipe to gauges.

C. Install pressure gauges with pulsation dampers. Provide needle valve to isolate each gauge. Extend nipples to allow clearance from insulation.

D. Provide siphon on pressure gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2" for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale. Scale selected shall operate near center of range.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

I. Locate test plugs where indicated on Plans. Also provide adjacent pressure gauges, thermometers and EMCS temperature or pressure sensors even if not shown. Install test plugs on the inlet and discharge of all heating equipment, boilers, pumps, heat exchangers, coils, hot water tanks, etc., even if not shown on Plans.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING, PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Valve Tags.

C. Pipe Markers and Arrows.

D. Equipment Identification Nameplates.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

B. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification, include matching size and colored arrows.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturer’s catalog literature for each product required.

D. Project Record Documents: Record actual locations of tagged valves, on As-Built's.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation

B. Seton Identification Products

C. Marking Services, Inc.

D. Approved equal.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height, Equipment: 1-1/2"
   3. Background Color: Black.

2.3 VALVE TAGS

A. Metal Tags: Brass with stamped blackened letters; tag size minimum 1-1/2" diameter with smooth edges, 40 mils thick.

B. Tag Lettering: First Line = System Abbreviation; Second Line = Consecutive Valve Numbers, staring at 01.

C. Beaded Chain: #6 x 4-1/2" - Nickel Plated.

2.4 PIPE MARKERS AND ARROWS

A. Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Plastic Tape Pipe Arrows: Nominal sizes and colors to match pipe markers. 1", 2" and 4".

D. Size of pipe markers:
1. 3/4" to 1-1/4" OSD of covering = 1/2" letters.
2. 1-1/2" to 2" OSD of covering = 3/4" letters.
3. 2-1/2" to 6" OSD of covering = 1-1/4" letters.
4. 8" to 10" OSD of covering = 2-1/2" letters.
5. Over 10" OSD of covering = 3-1/2" letters.

2.5 EQUIPMENT IDENTIFICATION NAMEPLATES

A. Description:
1. Plastic Laminate 1-1/4" letters and arrow.
2. Vinyl Markers 1-1/4" letter and arrow.
3. Color per ASME standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates and markers with corrosion-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion.

B. Install tags with nickel-plated chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions. Install a circular wrap of arrows at each end of the pipe marker.

D. Install plastic tape pipe arrows completely around pipe in accordance with manufacturer's instructions.

E. Identify all mechanical equipment, air handling units, pumps, heat transfer equipment, tanks, water treatment devices, etc., with plastic nameplates.

F. Identify control panels and major control components on outside of panels with plastic nameplates.

G. Identify ALL valves with tags.

H. Tag automatic controls, instruments, valves and relays. Key to control schematic, show on control As-Builts. Provide tags identical to valve tags. First line = abbreviation [EMCS]. Number consecutively starting at 01.

I. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20' on center for straight runs including risers and drops, adjacent each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass Fiber Pipe Insulation, Rigid and Semi-Rigid

B. Cellular Glass

C. Jackets

D. Flexible Insulation Blanket/Pad

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

D. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

G. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

H. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

I. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

J. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

O. All insulation material and installations shall meet or exceed Washington State Energy Code.

P. All codes and standards shall be latest version as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials, thickness for each service, and locations.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed systems.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50 maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Provide thickness of insulation to meet or exceed Washington State Energy Code and/or local codes, whichever is more stringent.

2.2 MANUFACTURERS

A. Knauf Fiberglass

B. Johns Manville Corporation

C. Owens Corning Corporation

D. CertainTeed Corporation

E. Pittsburgh Corning Corporation

F. Armacell International

G. Approved equal

2.3 GLASS FIBER

A. Pipe Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible, with factory applied vapor barrier jacket.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2% by volume.

B. Usage: Domestic Water, Condensate Piping - Interior - Medium to Low Temperature, bare tanks and uninsulated plumbing equipment.

C. Vapor Barrier Jacket: White kraft paper, Foil-Scrim-Kraft, (FSK), with 2" overlapped joints, and glass-fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

D. Tie Wire: 0.048” stainless steel with twisted ends on maximum 12” centers.

E. Vapor Barrier Coating:
1. Manufacturers:
   a. Childers Model CP-35
   b. Approved equal.
2. Compatible with insulation.

F. Insulating Mastic/Coating:
1. Manufacturers:
   a. Childers Model CP-10/11
   b. Approved equal.

G. Fibrous Glass Fabric:
1. Cloth: Untreated; 9 ounces per square yard.
2. Blanket: 1.0 pounds per cubic foot density.
3. Weave: 5x5.

H. Combination Coating and Lagging Adhesive:
1. Manufacturers:
   a. Childers Model CP-50A HV2
   b. Approved equal.

I. Fibrous Adhesive:
1. Manufacturers:
   a. Childers Model CP-97
   b. Approved equal.

2.4 JACKETS

A. PVC Plastic.
1. Jacket: One-piece molded-type fitting covers and sheet material; off-white color.
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.
   c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 10 mil.
   e. Connections: Brush-on welding adhesive.
2. Covering Adhesive Mastic:
   a. Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.040” sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2” laps.
4. Fittings: 0.016” thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8" wide; 0.010" thick stainless steel.

C. Flexible insulation blanket/pad: Filled with fiberglass insulation, encased in textile fabric and components. Blankets to be wired on, using copper wire and attached

hooks. Blankets to be removable and reusable on maintenance items, such as pumps, valves, y-strainers, balance valves, etc. Lap over adjacent insulation a minimum of 3".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards, have a copy on site for reference. Employ only skilled tradesmen specializing in this kind of work.

C. Exposed Piping: Locate seams of insulation and cover in least visible locations.

D. Insulated piping conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated piping conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stainless steel staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent piping. Finish with PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment. Bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets with vapor barrier, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stainless steel staples. Maintain a continuous vapor barrier.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers.

H. Inserts and Shields: Provided and installed by piping contractor at each hanger. Reference Section 22 00 20.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

J. Insulate all domestic cold water, copper condensate piping, rain leaders and roof drain bowls with a minimum of 1/2" insulation or as required by the Washington State Energy Code and or local codes, whichever is more stringent.

K. Piping Exposed in finished and Mechanical Spaces less than 10’ above finished floor: Finish with aluminum jacket and aluminum fitting covers.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish

vapor barrier. Cover with stainless steel jacket with seams located on side of horizontal piping, lapped so that water cannot enter; make watertight.

3.3 SCHEDULES OF THICKNESSES

A. Provide thicknesses of insulation to meet or exceed Washington State Energy Code and or local codes, whichever is more stringent.

END OF SECTION

SECTION 22 10 05

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water Piping, Buried to 5' outside of Building
B. Water Piping, Above Grade
C. Flanges, Unions, and Couplings
D. Pipe Hangers and Supports
E. Ball Valves
F. Butterfly Valves
G. Flow Control Valves / Circuit Balance Valves
H. Swing Check Valves
I. Water Pressure Reducing Valves
J. Relief Valves
K. Solenoid Valves
L. Strainers
M. Drain Valves

1.2 RELATED REQUIREMENTS

A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
B. Section 22 07 19 - Plumbing Piping Insulation.
C. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.
D. Division 31 - Excavation, Fill, and Trenching.

1.3 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; (ANSI B16.18).
B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
C. ASME B16.51 Copper and Copper Press-Connect Pressure Fittings
D. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; (ANSI/ASME B31.9).
E. ASTM B32 - Standard Specification for Solder Metal.
F. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
G. ASTM B75 - Standard Specification for Seamless Copper Tube.
H. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
I. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.

J. ICC LC1002 PMG Listing Criteria for Press Connection Fittings for Potable Water Tube and Radiant Heating Systems

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

L. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

M. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

N. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

O. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

Q. NSF Standard 14: Plastic Piping Components & Related Materials

R. NSF 61 & NSF 372 Drinking water system components and drinking water systems components – lead content.

S. NSF 61-G Annex G Lead Free Designation

T. All codes and standards shall be latest version as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide data on all materials, tubing, tube fittings, valves, and accessories. Provide manufacturer’s catalog information. Indicate valve data and ratings.

B. Shop Drawings: Provide drawings covering all specially-designed hanger assemblies and fabrications. Also provide drawings showing assemblies of standard manufactured hangers based upon this particular project’s requirements.

C. Project Record Documents: Record actual locations of valves, buried piping, and any other changes made to contract drawings.

D. Mechanical Contractor to submit sketches covering all hangers proposed for use on this project. Manufacturer’s data shall also be submitted.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. All domestic water piping and valves in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

D. Do not solder within 12” of valves manufactured from any bismuth alloy.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping systems from entry of foreign materials by providing temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 USAGE

A. Copper piping shall be utilized for all domestic water piping with the exception of the PEX piping located downstream of the residential unit piping manifolds.

PART 2 - PRODUCTS

2.1 WATER PIPING, BURIED TO 5' OUTSIDE OF BUILDING

A. Copper Tube: ASTM B42, hard drawn, type K.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8, BCuP silver braze.

2.2 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Hard Drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints:
      a. ASTM B 32, lead-free solder.
      b. Extracted collars approved for pipe sizes 1/2" to 2". For joints made with a T-Drill mechanical extractor, follow manufacturer’s operating instructions.
      c. Press-Seal Fitting, approved for pipe sizes 1/2" to 4".
         1) Manufacturers
            a) Viega,
            b) Nibco Press System
            c) Approved equal
         2) Fittings shall be manufactured with an inboard bead design having compression crimp applied on both upstream and downstream sides of EPDM elastomeric seal bead and un-pressed fitting leak identification feature. 2-1/2” thru 4” shall have a 420 stainless steel grip ring, PBT separator ring, and EPDM sealing element.
      d. Mechanical Couplings: See paragraph “Flanges, Unions and Couplings”

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 2" and Under:
   1. Copper tube: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size 2-1/2" and larger.
   1. Copper tube: Class 150 slip-on bronze flanges; preformed EPDM gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints
   1. Manufacturers:
      a. Victaulic
      b. Gruvlok
      c. Approved equal
   2. Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   3. Grooved mechanical couplings. 200 psi minimum joint working pressure, cast ductile iron housing conforming with ASTM A-536. Gaskets for domestic water service, EPDM per ASTM D-2000.
   4. Grooved mechanical flange adapters shall be ductile iron (ASTM A-536), engaging directly into roll grooved copper tube and fittings and bolting directly into ANSI Class 150 steel flanged components. Gasket material similar to coupling gasket material noted above.
   5. Dimensions and Testing: In accordance with AWWA C606.
   6. Housing Material: Ductile iron conforming to ASTM A-536, grade 65-45-12.
   7. Housing Coating: Copper-colored alkyd enamel.
   8. Gasket Material: Grade EHP or EP, UL classified in accordance with ANSI/NSF 61 for cold +86°F/+30°C and hot +180°F/+82°C potable water service.
   9. Bolts and Nuts: Hot dipped galvanized.
   10. When pipe is field grooved, provide coupling manufacturer's grooving tools if required by manufacturer’s warranty.

D. Dielectric Connections
   1. Manufacturers:
      a. Victaulic
      b. Gruvlok
      c. Approved equal
   2. Provide dielectric waterway fittings that maintain external electrical continuity while maintaining internal isolation. Fittings shall comply with ASTM F 492, and be listed by IAPMO. For pipe sizes 2" and less used dielectric nipples and for pipe sizes 2-1/2" and larger use dielectric flange kits. Do not use dielectric unions.

2.4 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with ASME B31.9, MSS SP-58 & SP-69.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 & SP-69 recommendations, see Section 22 00 20.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Supports for roof mounted pipe, for flat roof applications, see Section 22 00 20

B. Plumbing Piping - Water:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2" to 2": Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Water Piping Sizes 2" and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Water Piping Sizes 2" and over: Carbon steel, adjustable, clevis.
5. Adjustable side beam clamps MSS-SP69-Type 25 or approved equal.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Piping Sizes 6" and over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
8. Vertical Support: Steel riser clamp.
9. Floor Support for Cold Piping: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and or steel support.
10. Floor Support for Hot Piping: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and steel support.
11. Floor Support for Hot Piping Sizes 6” and Over: Adjustable cast iron pipe roll and stand, steel screws, and steel support.
12. Copper Tube Support: Carbon steel ring, adjustable, copper plated.
13. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded, zinc plated.
14. All hanger materials to be zinc or cadmium plated.
15. Isolate all pipe work within the first 50' of vibration isolated equipment or within the mechanical spaces, whichever is greater.
16. Provide roller hangers for all applications where thermal movement causes hanger rods to deviate more than 4 degrees from vertical or longitudinal movement exceeds 1/2". Provide protection saddles for use with roller hanger.
17. All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC Steel Handbook and furnished by the Mechanical Contractor and shall have one coat of primer paint prior to or after installation.
18. It shall be the responsibility of the Mechanical Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard, commercially-accepted pipe hangers and accessories.

2.5 VALVES

A. Manufacturers:
1. Armstrong
2. Apollo
3. Asco
4. Griswold Controls
5. Gruvlok
6. Kitz
7. Milwaukee Valve Company
8. Nexus
9. Nibco, Inc.

10. Red-White Valve Corporation
11. Stockham Valve Company
12. ThermOmegaTech
13. Tour Anderson
14. Victaulic
15. Viega, LLC
16. Watts Regulator Company
17. Zurn-Wilkins Industries
18. Approved equal

B. Ball Valves
1. 2" and Smaller:
a. MSS SP-110, 150 psig SWP, 600 psig CWP, bronze, two-piece body, chrome-plated brass ball, full port, teflon seats and stuffing box ring, blow-out-proof stem, lever handle, with solder, threaded, or grooved ends; provide stem extension to allow operation without interfering with pipe insulation.

C. Butterfly Valves
1. 2-1/2" and Larger:
a. MSS SP-67, 200 psi CWP, ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, lug ends, extended neck, infinite position lever handle with memory stop.
b. Provide gear operators for valves 6" and larger.
c. Provide chain-wheel operators for valves 6" and larger mounted over 8' above floor.
d. Provide butterfly valve with gear operator for main building shut off.

D. Flow Control Valves / Circuit Balance Valve
1. 3" and Smaller:
a. Class 125, Brass or bronze body with union on inlet , temperature and pressure test plugs on inlet and outlet .
b. To retain calibrated accuracy, a minimum length of unrestricted straight pipe adjacent the valve shall be 3 pipe diameters upstream, and 1 pipe diameter downstream.

E. Swing Check Valves
1. Up to 2":
a. MSS SP-80, Class 150, bronze body and cap, bronze swing disc with bronze seat, solder or threaded ends.

F. Water Pressure Reducing Valves
1. Single Valves
a. Up to 2":
1) Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends. Equal to Watts 223, lead free.
b. 2-1/2" and larger:
1) Bronze body, stainless steel and elastomeric diaphragm and seat disc, flanged ends. Equal to Watts N223B, lead free.

2. Range 30 to 150 psi for dead end service. Spring to act directly on valve stem. Delivery pressure shall not vary more than one psi for each 10 psi variation in inlet pressure.

G. Relief Valves
1. Pressure Relief:
a. CSA certified to ANSI Z21.22, bronze body, teflon seat, steel stem and springs, automatic, direct-pressure actuated. Capacity ASME(BPV IV) certified and labeled.
2. Temperature and Pressure Relief:
a. CSA certified to ANSI Z21.22, bronze body, teflon seat, stainless steel stem and springs, automatic, direct-pressure actuated. Temperature relief maximum 210 degrees F. Capacity ASME (BPV IV) certified and labeled.

H. Solenoid Valves
1. 2-1/2" and smaller; brass or stainless steel body, stainless steel internal components, 24vdc or 120vac operation, watertight or watertight/explosion-proof solenoid enclosure, CSA certified. Valves shall be line size and full port. Asco 8210 or approved equal.

I. Strainers
1. Size 2" and Under:
a. Threaded bronze body for 175 psi working pressure, Y-pattern with 1/32” stainless steel perforated screen. Equal to Watts 777. Provide lead-free models where in contact with potable water.
2. Size 2-1/2" and Larger:
a. Class 125, flanged bronze or grooved ductile iron body, Y- pattern with 3/16” stainless steel perforated screen. Equal to Watts 77F-B. Provide lead-free models equal to Watts 77F-DI-FDA-125 where in contact with potable water.

J. Drain Valves
1. Provide a full-port ball valve with 3/4" hose connection, cap and chain at all low points and at equipment drains. Nibco T-585-70HC or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt; protect open ends with temporary plugs or caps.

E. After completion, fill, clean and disinfect system.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Lead type solders are not allowed on the jobsite.

C. Use only water soluble paste flux designed to work with lead free solders.

D. Do not solder within 12” of valves, flanges, etc., manufactured from any bismuth alloy.

E. Provide non-conducting dielectric waterway connections wherever jointing dissimilar metals. Dielectric unions are not allowed.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain 6'-8" headroom minimum, conserve space, and do not interfere with use of the space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.

K. Provide access where valves and fittings are not exposed, minimum size 12" x 12".

L. Install valves with stems upright or horizontal, not inverted.

M. Provide circuit balance and check valves between domestic hot water and hot water circulating branch lines on the return leg, even if not shown on the Plans. All branches are to be balanced.

N. Install water piping to ASME B31.9.

O. Copper Tube Extracted Joints may be used on copper tubing. Dimple branch connection to control insertion. Brazed joints only.

P. Tube Press Fit Joints shall be installed in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked after pressing against the mark on the tubing to assure the tubing is fully inserted into the fitting. The joints shall be pressed using only the tool approved by the manufacturer.

Q. Copper Tube Rolled Groove joints shall be installed in accordance with manufacturer's instructions.

R. Provide sleeves for pipes passing through partitions, walls and floors. Use commercially manufactured modular seals for sleeves passing through floors, below-grade walls and floor slabs below grade. Make these penetrations water-tight against ground water pressure.

S. Pipe Hangers and Supports:
   1. It shall be the responsibility of the Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard commercially-accepted pipe hangers and accessories.
   2. Install in accordance with ASME B31.9 and MSS SP-89.
   3. Use only adjustable side beam clamps (Type 25); standard beam clamps are not acceptable.
   4. Inserts and shields are to be placed at each hanger by the piping contractor. Reference Section 22 00 20.

5. Install hangers to provide a minimum of 1/2" space between finished covering and adjacent work.
6. Place hangers within 12" of each horizontal elbow.
7. Use hangers with 1-1/2" minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
8. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
9. Where more than one piping run can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
10. Provide copper-plated hangers and supports for un-insulated copper tubing. Pipe-tight hangers are acceptable only for piping conveying fluids at ambient temperatures. All Hot Water, Hot Water Circulating, Cold Water piping, etc., is to be insulated.
11. Provide hangers adjacent motor-driven equipment with vibration isolation.
12. Auxiliary Steel: All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC Steel Handbook, and shall be furnished and installed by this Contractor.
13. All steel rods, hangers and brackets, shall be electro-plated. Custom fabricated steel brackets or hangers shall receive one shop coat primer paint by this Contractor.

3.3 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Provide unions downstream of valves and at equipment or apparatus connections.

C. Provide ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.

D. Provide flow controls in water recirculating systems where required or indicated.

E. Provide isolation valves with positive shutoff for domestic hot water, cold water and hot water recirculation at public restrooms. Isolation valves shall be located above T-bar ceiling in area adjacent restrooms where possible. If located above a hard ceiling, provide access panel.

F. Connect hot water circulating piping to hot water piping within 24” of plumbing fixtures. Bring circulating piping down into wall as needed to meet this distance requirement.

3.4 TOLERANCES

A. Water Piping: Slope at minimum of 1/32” per foot, and arrange to drain at low points.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Inject disinfectant (free chlorine in liquid, powder, tablet or gas form) throughout system to obtain 50 to 80 mg/L residual.

C. Bleed water from outlets to ensure distribution, and test for disinfectant residual at minimum of 15% of outlets.

D. Leave disinfectant in system for 24 hours.

E. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

F. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.

G. Take samples no sooner than 24 hours after flushing, from 10% of outlets and from water point of entry; analyze in accordance with AWWA C651.

H. Provide copies of certified test reports from the Health Department to the Owner's Commissioning Agent, Owner's representative, and General Contractor prior to occupancy.

3.6 SERVICE CONNECTIONS

A. Provide new water service complete with the following components in a Water Header as detailed on the contract drawings.
   1. Approved reduced pressure backflow preventer (RPBP); do not install bypass or add drains or vents upstream of the RPBP.
   2. Pressure reducing valve (PRV) with bypass and globe valve.
   3. Y-Strainer, to share bypass with PRV. Pipe strainer blow-off to nearest drain; provide full-port ball valve on drain.
   4. System-rated water hammer arrestors: Provide PPP SCS Series 150-pound flanged, 3" minimum size.
   5. Drain valves: Provide at low point on header.
   6. Pressure Gauges. Provide two minimum, located on each side of PRV.
   7. Provide sleeves in walls or floors for service mains. Make watertight with commercially-manufactured modular seals and pliable material. Anchor service main inside of building to concrete walls or floors.
   8. Provide Schedule 40 galvanized pipe sleeve around service main to 1" above finished floor.
   9. Zone building from header. Where irrigation system is to be fed from the building system, provide a separate connection point at the header and space for a RPBP by others.
   10. See detail on Plans.

3.7 TESTING

A. Test Domestic Water a minimum of 100 PSI or 1-1/2 times incoming pressure whichever is greater and hold pressure for two hours, without loss of pressure. Have the test witnessed by the Commissioning Agent and the Owner's representative. If the building is phased, provide multiple tests as needed. Do not over pressurize the system if there is PEX tubing in the system.

END OF SECTION

SECTION 22 10 06

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior Hose Bibbs
B. Non-Freeze Wall Box Hydrants
C. Washing Machine Box
D. Refrigerator Recessed Box
E. Reduced Pressure Backflow Preventer
F. Double Check Valve Assemblies
G. Water Hammer Arrestors
H. Trap Primers
I. Thermostatic Mixing Valves

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Domestic Water Piping.
B. Section 22 40 00 - Plumbing Fixtures.
C. Section 22 30 00 - Plumbing Equipment.

1.3 REFERENCE STANDARDS

A. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).
B. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering.
C. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; (ANSI/ASSE 1019).
D. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute.
E. All codes and standards shall be latest version as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
B. Manufacturer's Instructions: Indicate manufacturer's installation instructions: Indicate assembly and support requirements.
C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. All Domestic Water Piping Specialties in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on-site in original factory packaging. Inspect for damage.

1.7 EXTRA MATERIALS

A. Supply for Owner's use in maintenance of project:
   1. One extra loose key for each inside and outside hose bibb and/or hydrants.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable codes for installation of backflow preventing devices.

B. Provide certificate from Authority Having Jurisdiction indicating approval of installation of backflow preventing devices.

PART 2 - PRODUCTS

2.1 INTERIOR HOSE BIBBS

A. Manufacturers:
   1. Chicago Faucet Company
   2. Woodford Manufacturing Company
   3. Acorn Engineering Company
   4. Zurn
   5. Approved equal

B. Interior Hose Bibbs: (Install where shown on the Plans), ASSE 1011.
   1. Bronze or brass, wall mounted, box type, single service faucet with hose thread spout, with chrome-plated wheel handle and vacuum breaker in conformance with ASSE 1011.
      a. Woodford B24-3/4" or approved equal for installation at chase wall.
   2. Recessed box-type with single service faucet.
      a. Box construction: Stainless steel, 18-gage box, 16-gage flange and door. Include cylinder lock with two (2) keys.
      b. Valve: Chrome-plated cast bronze, cartridge-operated with removable loose key wheel handle, screwdriver-operated stop, and vacuum breaker.
      c. Acorn model 8151 or approved equal for installation at non-chase wall.

2.2 NON-FREEZE HYDRANTS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company
2. Woodford Industries
3. Zurn
4. Approved equal

B. Wall Hydrant, Single Temperature, ASSE 1052
1. Box-type, integral vacuum breaker, nickel-plated bronze, quarter-turn, with wall clamp and T-handle key.
a. Jay R. Smith 5509QT or approved equal.

2.3 WASHING MACHINE BOXES

A. Box Manufacturers:
1. IPS / Guy Gray
2. Oatey
3. Water-Tite
4. Sioux Chief
5. Approved equal

B. Epoxy-coated steel box, brass valves, water hammer arresters, socket for 2" waste; Guy Gray "T" series or approved equal.

C. Fire-rated box: Epoxy-coated steel box, brass valves, water hammer arresters, and intumescent pads; Guy Gray FR-12 or approved equal.

2.4 REFRIGERATOR ICE-MAKER OUTLET BOX

A. Box Manufacturers:
1. IPS Corporation/Guy Gray
2. Oatey
3. Sioux Chief
4. Approved equal

B. Epoxy-coated steel rough-in box, lead-free valve, hammer arrester; Guy Gray IMOB, or approved equal.

C. Fire-rated box: Epoxy-coated steel rough-in box, brass valves, water hammer arresters, and intumescent pads; Guy Gray FR-12 or approved equal. For use in fire rated walls

2.5 DISHWASHER VALVE BOX

A. Box Manufacturers:
1. IPS Corporation/Guy Gray
2. Oatey
3. Approved equal

B. Epoxy-coated steel box, brass valve, hammer arrester.

2.6 REDUCED PRESSURE BACKFLOW PREVENTERS

A. Manufacturers:
1. Watts Regulator Company
2. Zurn/Wilkins Industries, Inc.
3. Approved equal

B. All reduced pressure backflow preventers shall be listed by the State of Washington Department of Health as an approved cross-connection control device.

C. Provide air-gap fitting and route drainage piping to nearest floor drain.

D. Reduced-Pressure Backflow Preventers (sizes 2” and larger)
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating spring-loaded check valves, diaphragm-type differential pressure relief valve located between check valves, third check valve that opens under backpressure in case of diaphragm failure, non-threaded vent outlet, assembled with two ball valves (gear-operated butterfly valves on 2-1/2" and larger), and four test cocks.
      a. Watts 957QT - Silver Eagle or approved equal.
   2. Gate valves to be bronze, or substituted with butterfly valves.

E. Reduced Pressure Zone Assembly (sizes under 2”)
   1. A Reduced Pressure Zone Assembly shall be installed at each potential health hazard location to prevent backflow due to back-siphonage and/ or back-pressure.
   2. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Seats and seat discs shall be replaceable in both check modules and the relief valve. There shall be no threads or screws in the waterway exposed to line fluids. Service of all internal components shall be through a single access cover secured with stainless steel bolts. Body and shutoffs shall be constructed using Lead Free* cast copper silicon alloy materials. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks, and an air gap drain fitting.
   3. Lead Free* reduced pressure zone assembly shall comply with state codes and standards requiring reduced lead content. The assembly shall meet the requirements of: USC; ASSE Standard 1013 and AWWA Standard C511; CSA B64.4.
      a. Watts Series LF009 or approved equal.

2.7 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Precision Plumbing Products
   3. Zurn Industries, Inc.
   4. Approved equal

B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows-type, sized in accordance with PDI-WH 201.
   2. Precharged, suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.8 TRAP PRIMERS

A. Manufacturers:
   1. Precision Plumbing Products, Inc.

2. Jay R Smith
3. Approved equal

B. General
1. Provide ball valve shut-off at each trap primer.
2. Provide an access panel large enough to remove and replace trap primer assembly; panel minimum size is 12" x 12".

C. Trap Primer for Individual Drains, for all additional traps where electronic trap primer is not shown on plans: Provide Prime-Rite PR-500 automatic trap primer for each floor drain and funnel floor drain. Primers shall be concealed, located in pipe space or wall cavities. Installation shall be per manufacturer's installation instructions.

D. Trap Primer for Multiple Drains: In addition to the trap primer specified above, add Prime-Rite primer valve DU-2, DU-3, or DU-4 distribution unit. A maximum of 4 floor drains may be fed off of one trap primer valve. Install additional trap primer valves as needed.

E. Electronic Trap Primer for one to four drains, Provide where shown on plans: Provide a PPP MPB-500 Mini-Primer with distribution unit, 120v, with electronic controller, 1/2" inlet, integral vacuum breaker and flush mount cabinet with prime coat or stainless steel access door as needed.

F. Electronic Trap Primer for four to thirty drains: Provide a PPP PT-*, Prime Time, 120v, with 24 hour clock, 3/4" inlet. integral vacuum breaker and flush mount cabinet with prime coated, stainless steel, or fire rated prime coated access door, as needed. * in model number indicates number of manifold openings.

2.9 THERMOSTATIC MIXING VALVES

A. Manufacturers:
1. Powers
2. Leonard Valve Company
3. Bradley
4. Lawler
5. Approved equal

B. Thermostatic Mixing Valves:
1. Valve: Cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment. Valve to have cold water bypass in case of valve failure or loss of hot water. Valve to be Certified lead free. ASSE 1017.
2. Capacity: See schedule.
3. Accessories:
a. Stem thermometer on outlet.
b. Strainer stop checks on inlets.

C. Individual Lavatory Mixing Valve
1. ASSE 1016, bronze body with corrosion-resistant internal parts, 1/2" NPT. Includes integral checks with screens and thermal actuator to compensate for inlet temperature fluctuations. Valve to be factory set at 105 degrees F. Install under individual public lavatories to mix and adjust hot water temperature. Each tempering valve shall serve an individual lavatory or sink. Valve to be Certified Lead Free.
2. Piping connections are to be made so as to permit proper operation of integral check valves.

3. Equal to Powers LFe480.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur, as required or as shown on the Plans.

C. Pipe drain from reduced pressure backflow preventer to nearest drain, utilizing an air gap fitting.

D. Provide individual mixing valves under the counter for all public lavatories.

E. The Mechanical Contractor shall be responsible for providing water to trap primers and running primer lines to the drains. Verify location of trap primers with Owner’s representative before installing. ALL floor drains and floor sinks, including showers, are to have primers. Show all trap primer locations on Record Drawings.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to public lavatories, sinks, washing machine outlets, etc. for fixtures equipped with quick-closing valves. Install on cold water supply for any fixtures with flush valves. Install on water stop or behind access panel for future maintenance; minimum panel size 12" x 12".

G. Provide access panels for all concealed valves in walls or above hard ceiling.

END OF SECTION

SECTION 22 10 07

CROSS-LINKED POLYETHYLENE PIPE FOR POTABLE WATER SERVICE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Potable hot and cold water distribution system, using cross-linked polyethylene (PEX) tubing and ASTM F1960 cold expansion fittings.

B. Piping for use downstream of residential piping manifolds.

1.2 REFERENCES

A. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

B. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials

C. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops

D. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing

E. ASTM F877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems

F. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing

G. ASTM F1807 Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing

H. ASTM F2159 Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing

I. ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials

J. ANSI/NSF Standard 61 Drinking Water System Components - Health Effects

K. ANSI/UL 263 Standard for Safety for Fire Tests of Building Construction and Materials

L. International Plumbing Code (IPC)

M. ICC Evaluation Service (ES) Evaluation Report No. ESR 1099

N. Uniform Plumbing Code (UPC)

O. HUD Material Release No. 1269

P. Plastics Pipe Institute (PPI) PPI Technical Report TR-4/06

Q. Canadian Standards Association (CSA) CAN/CSA B137.5 Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications

R. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 QUALITY ASSURANCE

A. Any product in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

1.4 DESIGN REQUIREMENTS

A. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute (PPI) in accordance with TR-3 as listed in TR-4. The following three standard-grade hydrostatic ratings are required.
   1. 200 degrees F at 80 psi
   2. 180 degrees F at 100 psi
   3. 73.4 degrees F at 160 psi

B. Tubing will meet certification of flame spread/smoke development rating of 25/50 in accordance with ASTM E84 provided the installation meets one of the following requirements.
   1. Tubing spacing is a minimum of 18” apart for the following sizes.
      a. 3/8”
      b. 1/2”
      c. 5/8”
      d. 3/4”
   2. Tubing is wrapped with 1/2” fiberglass insulation with a flame spread of not more than 20 and a smoke-developed rating of not more than 30 and a nominal density of 4.0 to 4.5 pcf. Tubing can run with three tubes separated by 0” and then 18”between the next group of three tubes for the following sizes.
      a. 3/8”
      b. 1/2”
      c. 5/8“
      d. 3/4”
      e. 1”
      f. 1-1/4”
      g. 1-1/2”
      h. 2”

C. Performance requirements: to provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure.
   1. Comply with ANSI/NSF Standard 14.
   2. Comply with ANSI/NSF Standard 61.
   3. Show compliance with ASTM F877.
   4. Show compliance with ASTM E119 and ANSI/UL 263 through certification listings with Underwriters Laboratories, Inc. (UL).
      a. UL Design No. L557 — 1 hour wood frame floor/ceiling assemblies
      b. UL Design No. K913 — 2 hour concrete floor/ceiling assemblies

c. UL Design No. U372 — 1 hour wood stud/gypsum wallboard wall assemblies
d. UL Design No. V444 — 1 hour steel stud/gypsum wallboard wall assemblies

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product submittal data and installation instructions.

C. Shop Drawings: Provide installation drawings indicating tubing layout, manifold locations, plumbing fixtures supported and schedules with details required for installation of the system.

D. Samples: Upon request, submit selection and verification samples of tubing.

E. Quality Assurance/Control Submittals: Submit the following:
1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
2. Certificates:
a. Manufacturer's certificate that products comply with specified requirements.
b. Certificate indicating that the installer is authorized to install the manufacturer's products

F. Closeout Submittals:
1. Warranty documents specified herein
2. Operation and maintenance data

1.6 RELATED SECTIONS

A. 22 07 19 Plumbing Piping Insulation

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of PEX plumbing installation training by the PEX tubing manufacturer.

B. Installer will use skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed trade professional.

1.8 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
   1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from being introduced into the tubing.
   2. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of tubing exposed to direct sunlight.

1.9 WARRANTY

A. Provide manufacturer's standard warranty; include in O & M Manual.

1.10 USAGE

A. PEX piping is allowed for use for all piping downstream of the residential piping manifolds. Copper shall be used for all other domestic water piping.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers
   1. Uponor
   2. Viega, LLC
   3. Zurn
   4. Approved equal.

B. Tubing
   1. Material: Crosslinked polyethylene (PEX) shall conform to ASTM F876, F877, ASTM E84, CSA B137.5, NSF 61 (NSF®us-pw) and tested for compliance by an independent third party agency.
   2. Standard grade hydrostatic design and pressure ratings from PPI
   3. Minimum Bend Radius (cold bending): No less than six (6) times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
   4. Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876.
   5. If PEX tubing is substituted for copper tubing, PEX piping sizes must be sized up one pipe size to compensate for the reduced inside diameter of PEX piping versus copper.

C. Fittings
   1. Material: Fitting assembly shall conform to ASTM F1960, F877, F1807, or F2159, and NSF 61 (NSF® pw-G). PEX Fitting for use with SDR Designated tube shall be cold expansion or PEX press, made from lead free bronze, Poly-Alloy, or Radel-R. Fittings are to be from the same manufacturer as piping.

D. Manifolds
   1. Material
      a. Poly-Alloy using PEX press connections.
   2. Manifold Type

a. Poly-Alloy from same manufacturer as piping.
b. All manifolds manufactured with the appropriate-sized fittings on the manifold supply inlets. Provide valve on each inlet.

E. Supports
1. Uponor Pex-a galvanized steel rigid piping supports
a. Supports shall be installed in accordance with manufacture requirements using strut and strut clamps.

F. Thermal expansion
1. Thermal expansion shall be limited to .08”/100’ per 10F, and installed with anchors spaced at 65’, supports at 96”. Contractor is responsible for a complete system based on actual pipe routing and actual expansion joints used.

G. Accessories
1. Angle stops and straight stops that are compatible with PEX tubing from same manufacturer as piping.
2. Fixture supply connections:
a. PEX stub-out with elbow support, escutcheon, and sleeve, ProPEX Out-Of-The-Wall Support System or approved equal.
b. Copper Type L stub-out; Sioux Chief PowerPEX or approved equal.
c. Chrome-plated Finishing Sleeve for covering PEX pipe stub-out between wall and supply stop.
3. Bend supports designed for maintaining tight radius bends from same manufacturer as piping, or Holdrite 704 or 734 PEX bend support brackets, or approved equal.
4. Expander tool to install the ASTM F1960 compatible fittings from same manufacturer as piping.
5. Clips and/or PEX rails for supporting tubing runs from same manufacturer as piping.
6. Provide epoxy-coated horizontal tubing hangers and riser clamps.

PART 3 - EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

A. Comply with manufacturer's product data, including product technical bulletins, installation instructions, design drawings and manufacturer's installation guide.

3.2 EXAMINATION

A. Site Verification of Conditions:
1. Verify that site conditions are acceptable for installation of the PEX potable water system.
2. Do not proceed with installation of the PEX potable water system until unacceptable conditions are corrected.

3.3 INSTALLATION

A. Tubing

1. Install tubing in accordance with the tubing manufacturer's recommendations and as indicated in the installation handbook.
2. Insulate all domestic water piping (hot and cold).
3. Do not install PEX tubing within 6” of gas appliance vents or within 12” of any recessed light fixtures.
4. Do not solder within 18” of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections.
5. Do not expose PEX tubing to direct sunlight for more than 30 days.
6. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer.
7. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs.
8. Protect PEX tubing with sleeves where abrasion may occur.
9. Use strike protectors where PEX tubing penetrates a stud or joist and has the potential for being struck with a screw or nail.
10. Use tubing manufacturer-supplied bend supports where bends are less than six times the outside tubing diameter.
11. Provide horizontal supports installed not less than 32” between hangers in accordance with model plumbing codes and the PEX piping installation handbook. Provide inserts at support locations.
12. PEX riser installations require epoxy-coated riser clamps installed at the base of the ceiling per floor.
13. A mid-story support is required for riser applications.
14. Pressurize tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 25 psi above normal working pressure of the system.
15. Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32°F.

B. Through-penetration Firestop
1. Ensure compliance of one- and two-hour rated through penetration assemblies in accordance with ASTM E814.
2. A list of firestop manufacturers that list PEX tubing with their firestop systems is available from the PEX tubing manufacturer.

C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

3.4 FIELD QUALITY CONTROL

A. Site Tests
1. Test systems at 100 PSI. Hold test for two-hours without loss of pressure.
2. Tests may be witnessed by the Owner’s representative, and any defects corrected to his satisfaction.

B. Manufacturer’s Field Services: Provide manufacturer’s field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer’s instructions.

3.5 CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace damaged installed products.

C. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

D. Remove construction debris from project site and legally dispose of debris.

3.6 DISINFECTION

A. General: New or repaired water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to "on site" or "in plant" fabrication of a system or to a modular portion of a system.

1. Procedure:

a. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.

b. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for no longer than 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.

c. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

d. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

3.7 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE, VENT, AND STORM PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, and connections for piping systems
B. Sanitary Sewer Piping, Buried to 5' Outside of Building
C. Sanitary Sewer piping, Above Grade
D. Storm Water Piping, Buried to 5' Outside of Building
E. Storm Water Piping, Above Ground
F. Forced Sewer Piping Under Pressure
G. Flanges, Unions, and Couplings
H. Pipe Hangers and Supports

1.2 RELATED SECTIONS

A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
B. Section 22 07 19 - Plumbing Piping Insulation.
C. Division 31 - Excavation, Fill, Trenching.

1.3 REFERENCES

A. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; (ANSI/ASME B31.9).
B. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
C. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
D. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
E. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.
F. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute.
G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
H. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
I. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
J. ASTM D 2321 Underground Installation of Thermoplastic Pipe (nonpressure applications)

K. ASTM F 1668 Procedures for Buried Plastic Pipe

L. NSF Standard 14 Plastic Piping Components and Related Materials

M. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

B. Provide sketches covering all specially designed hanger assemblies and fabrications. Also provide sketches showing assemblies of standard manufactured hangers based on this particular project's requirements.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Accept products on-site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AB&I

B. Charlotte

C. Tyler

D. Approved equal

2.2 SANITARY SEWER PIPING, BURIED TO 5' OUTSIDE OF BUILDING

A. Cast Iron Pipe: CISPI 301 and ASTM A888, hubless.
   1. Fittings: Iron.
   2. Joints: Heavy-duty shielded, stainless steel couplings, with stainless steel shield, stainless steel bands and tightening devices and ASTM C56A rubber sleeve.
      a. Manufacturers
         1) Clamp-All Hi -Torq 125
         2) Husky SD 4000
         3) Approved equal; must be listed for underground application.
   3. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301 and ASTM A888, hubless.
   1. Fittings: Iron.

2. Joints: CISPI 310, neoprene gasket or stainless steel clamp and shield assemblies conforming to ASTM C1277.
   a. Manufacturers
      1) Clamp-All Hi-Torq 125
      2) Husky SD 4000
      3) Or Approved Equal.
3. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute, and be listed by NSF International.

B. PVC Schedule 40 solid wall DMV (VENT PIPING ONLY)
1. Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Injection molded PVC DWV fittings shall conform to ASTM D 2665.
2. Fabricated PVC DWV fittings shall conform to ASTM F 1866.
3. All pipe and fittings are to be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and local code requirements.
4. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564.
5. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds.
6. The system shall be hydrostatically tested after installation.
7. Pipe and fittings shall conform to NSF International Standard 14.

2.4 STORM WATER PIPING, BURIED TO 5' OUTSIDE OF BUILDING

A. Cast Iron Pipe: CISPI 301 and ASTM A888, hubless.
1. Fittings: Iron.
2. Joints: Heavy-duty shielded, stainless steel couplings, with stainless steel shield, stainless steel bands and tightening devices and ASTM C56A rubber sleeve.
   a. Clamp-All Hi-Torq 125
   b. Husky SD 4000
   c. Or Approved Equal.
3. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute, and be listed by NSF International.

2.5 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301 and ASTM A888, hubless.
1. Fittings: Iron.
2. Joints: Heavy-duty shielded, stainless steel couplings, with stainless steel shield, stainless steel bands and tightening devices and ASTM C56A rubber sleeve.
   a. Clamp-All Hi-Torq 125
   b. Husky SD 4000
   c. Or Approved Equal.

3. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute, and be listed by NSF International.

2.6 FORCED SEWER PIPING UNDER PRESSURE

A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51, 0.25” wall thickness, 350 psi pressure class

B. Fittings: Ductile Iron ANSI/AWWA C153/A21.53, rated for 350 psi waste water pressure.

C. Joint Seals: ANSI/AWWA C111/A21.11 TYTON JOINT® Pipe rubber gasket joints. All buried joints shall be restrained, mechanical joints. Rated for 350 psi waste water pressure.

2.7 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2” to 1-1/2”: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2” and Over: Carbon steel, adjustable, clevis.
4. Adjustable side beam clamps MSS-SP69-Type 25 or approved equal.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Keep open ends of pipe free from scale and dirt, protect open ends with temporary plugs or caps.

D. After completion, fill, clean and flush system.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain 6'-8" minimum headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, or joints.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; All pipe shall be flashed, flashing shall extend to at least 10" in all directions from pipe and run at least 12" above roof around pipe. Each pipe shall be counter-flashed or turned down inside of pipe. Vent flashing shall be made watertight. Two-piece flashings are not acceptable.

H. Install bell and spigot pipe with bell end upstream.

I. Discharge from forced main shall discharge into a vertical receptor with air gap prior to entering the gravity waste system.

J. Pipe Hangers and Supports:
   1. It shall be the responsibility of the Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard commercially-accepted pipe hangers and accessories.
   2. Use only adjustable side beam clamps (Type 25), standard beam clamps are not acceptable.
   3. Inserts: Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. The insert is to consist of either hydrous calcium silicate or polyisocyanurate foam insulation (urethane) encircling the entire circumference of the pipe, with a 360-degree PVC (1/16” thick) or galvanized steel jacket (20 gauge minimum). Inserts are to be installed on piping during piping installation, by the piping contractor. Provide continuous insulation vapor barrier. Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
   4. Install hangers to provide a minimum of 1/2” space between finished covering and adjacent work.
   5. Place hangers within 12” of each horizontal elbow.
   6. Use hangers with 1-1/2” minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   7. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   8. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   9. Provide hangers adjacent to motor driven equipment with vibration isolation.
   10. Support cast iron drainage piping at every joint.
   11. Auxiliary Steel: All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC Steel Handbook, and furnished and installed by this Contractor.
   12. All steel rods, hangers and brackets, shall be electro-plated. Custom-fabricated steel brackets or hangers shall receive one shop coat of primer paint by this Contractor.

K. Indirect drain piping shall terminate two (2) pipe diameters above the flood rim of the receptor and shall be cut at a 45 degree angle.

3.3 ERECTION TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2” vertically of location indicated and slope to drain at minimum of 1/4” per foot slope.

3.4 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide sleeves in walls or floors for service mains. Caulk enlarged sleeve and make watertight with modular seals and pliable material. Anchor service main inside to concrete walls or floors.

C. Sleeves around service mains to be Schedule 40 galvanized pipe to 1" above finished floor.

D. Backflow Protection: Fixtures installed on a floor level that is lower than the next upstream manhole cover of the public or private sewer shall be protected from backflow of sewage by installing an approved type of backwater valve (reference Section 22 13 19). Fixtures on such floor level that are not below the next upstream manhole cover shall not be required to be protected by a backwater valve. Fixtures on floor levels above such elevation shall not discharge through the backwater valve. Cleanouts for drains that pass through a backwater valve shall be clearly identified with a permanent label stating “Backwater Valve Downstream”.

3.5 TESTING

A. Test the Drainage Systems as required by local Authority Having Jurisdiction.

END OF SECTION

SECTION 22 13 19

SANITARY & STORM PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof and Floor Drains

B. Cleanouts

C. Vandal-Proof Hooded Vent Caps

1.2 RELATED SECTIONS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 40 00 - Plumbing Fixtures.

C. Section 22 30 00 - Plumbing Equipment.

D. Division 31 - Excavation, Fill, and Trenching.

E. REFERENCES

F. ASME A112.6.3 - Floor Drains; The American Society of Mechanical Engineers.

G. ASME A112.6.4 – Roof Drains; The American Society of Mechanical Engineers.

H. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

C. Operation Data: Indicate frequency of treatment required for interceptors.

D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Light commercial drains and cleanouts are not acceptable. If found on this project they will be removed and replaced by the Mechanical Contractor, at no cost to the Owner.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 ROOF DRAINS

A. Manufacturers:
1. Froet Industries
2. Jay R. Smith
3. Wade, Inc.
4. Zurn Industries, Inc.
5. Josam
6. Mifab
7. Sioux Chief
8. Approved equal.

B. Roof Drains (RD):
1. Assembly: ASME A112.6.4.
2. Body: Galvanized cast iron with sump.
3. Strainer: Removable cast iron, galvanized dome with vandal proof screws.
4. Accessories: Coordinate with roofing type, refer to Roofing Section.
a. Membrane flange and membrane clamp with integral gravel stop.
b. Adjustable under deck clamp.
c. Roof sump receiver.
d. Waterproofing flange.
e. Controlled flow weir.
f. Leveling frame.
g. Adjustable extension sleeve for roof insulation.
h. Perforated or slotted ballast guard extension for inverted roof.
i. Perforated stainless steel ballast guard extension.
j. Expansion Joints, where needed.

C. Roof Overflow Drains (ROFD):
1. Galvanized cast iron, body and clamp collar, same as RD above, with the addition of a 2” dam extended above flood elevation

D. Combination Roof/Overflow Drain:
1. Galvanized cast iron, body with clamp collar, has the same features as RD and ROFD above, in a single drain body.

E. Downspout Nozzles (DN):
1. Polished bronze body, round with straight bottom section, decorative face and threaded inlet, secure with solid bronze screws.

F. Down Spout Boots (DSB):
1. Lacquered cast iron body and strap. Downspout size up to 4" x 3". Outlet 4" pipe size. Overall height 24". Secure with Stainless Steel Fasteners. Downspout by others. Storm water to 5' out and final connection by Mechanical Contractor, beyond 5' out by others.

2.2 FLOOR DRAINS

A. Manufacturers:
1. Jay R. Smith
2. Wade, Inc.
3. Zurn Industries, Inc.
4. Josam

5. Mifab
6. Sioux Chief
7. Approved equal.

B. Floor Drain (FD):
1. ASME A112.6.3; galvanized cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, trap primer connection, vandal-proof screws, and round, adjustable nickel-bronze strainer.

C. Floor and Funnel Drain (F&FD):
1. Cast iron two-piece body with flashing collar, seepage openings, round polished nickel bronze (stainless steel) adjustable strainer head and grate complete with 4" diameter polished nickel bronze funnel, trap primer connection and vandal-proof screws.

D. Floor Sink (FS):
1. Galvanized cast iron body with acid-resistant interior, seepage flange, flashing clamp, aluminum dome strainer, and vandal-proof screws. Size 8" x 8" x 6"deep. Equal to Jay R Smith 3100.
2. Grate:
a. Nickel Bronze Rim, 1/2 Grate

2.3 CLEANOUTS

A. Manufacturers:
1. Jay R. Smith
2. Zurn Industries, Inc.
3. Wade, Inc.
4. Mifab
5. Josam
6. Sioux Chief
7. Approved equal.

B. Cleanouts at Exterior Surfaced Areas (SCO):
1. Round cast nickel bronze access frame and non-skid cover, marked “CO”.

C. Cleanouts at Exterior Unsurfaced Areas (SCO):
1. Same as above except with 18" x 18" x 4" concrete pad around cleanout.

D. Cleanouts at Interior Finished Floor Areas (FCO):
1. Lacquered cast iron body with anchor flange, threaded top assembly, and round scoriated secured nickel bronze cover in a round depressed frame, with ABS tapered threaded plug.
2. Cleanouts at Interior Finished Floor Areas for Carpeted Floors:
a. Where cleanout is installed in carpeted areas, provide nickel bronze carpet clamp frame.
b. MC to coordinate carpet clamp rings or correct after carpet installation.
3. Cleanouts at Interior Finished Floor Areas for Tile Floors:
a. Where cleanout is installed in tiled areas, provide nickel bronze top with 1/8" tile recess cover; obtain tile piece to insert into cover.

E. Cleanouts at Interior Finished Wall Areas (WCO):

1. Line type with lacquered cast iron body and ABS tapered thread plug, and round smooth stainless steel access cover secured with stainless steel machine screws.

F. Cleanouts at Interior Unfinished Accessible Areas (CO): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

G. Provide cleanouts at each pair of 45-degree elbows. At each 90-degree turn, and at each 50’ of straight run.

H. Cleanouts shall be line size up to and including 3” piping, and 4” for piping 4” and larger.

2.4 VANDAL-PROOF HOODED VENT CAPS

A. Manufacturers:
1. Jay R. Smith
2. Zurn Industries, Inc.
3. Wade, Inc.
4. Josam
5. Mifab
6. Approved equal.

B. Provide vandal proof vent caps on all vents passing through the roof. Vent caps to be lacquered cast iron body and dome. All units to be secured with fasteners internal to the units. Vent caps do not need flashing sleeves unless roofing membrane extends up vent.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. MC to coordinate the height of floor drains with the GC.

C. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil.

D. Ensure adequate clearance at Floor Cleanouts and Floor Drains for rodding of drainage system; 18” minimum required. Do not install Floor Cleanouts or Floor Drains directly under toilet partitions.

E. Encase exterior cleanouts in concrete flush with grade.

F. Install floor cleanouts at elevation to accommodate finished floor. Mechanical Contractor to coordinate with floor finisher for a smooth finished floor.

G. Provide proof to the Owner’s representative that limestone supplies for the Acid Neutralization Tank have been provided to the Owner.

H. Provide traps and trap primers for all drains (floor drains, trench drains, floor sinks, etc.)

I. Provide two-way cleanout at junction of building drain and building exterior sewer. Provide concrete pad around cleanout; see contract drawing details.

J. All downspouts shall be furnished and installed by the General Contractor.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Residential Electric Water Heater

B. Commercial Electric Water Heater

C. Water Heater Drain Pan

D. Diaphragm-Type Compression Tank

E. In-Line Circulator Pump

F. Elevator Sump Pump

1.2 RELATED REQUIREMENTS

A. Division 31 - Excavation, Trenching, Fill

1.3 REFERENCE STANDARDS

A. ASME CODE (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.

B. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.

C. UL 1453 - Standard for Electric Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.

D. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted.
   4. Provide electrical characteristics and connection requirements.

B. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Manufacturer's Installation Instructions.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

C. All Domestic Water Piping Equipment in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

D. Provide Thermostatic Mixing Valves at each water heater or as shown on Plans. Reference Section 22 10 06. See detail on Plans.

1.6 CERTIFICATIONS

A. All water heaters shall meet the requirements of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 90.1-1999 and be so labeled. Controls shall not allow water temperature to exceed 210 degrees F. Water heaters shall comply with all provisions of the Washington State Energy Code.

B. Water Heaters and Domestic Water Expansion Tanks shall be NSF approved.

C. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453 and ASME CODE (for commercial tanks) labeled to ASME CODE (BPV VIII, 1).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

A. Provide five (5) year manufacturer warranty for domestic water heaters.

PART 2 - PRODUCTS

2.1 WATER HEATER MANUFACTURERS

A. A.O. Smith Water Products Co

B. Bradford White

C. Bock

D. Approved equal

2.2 RESIDENTIAL ELECTRIC WATER HEATERS

A. Type: Automatic, electric, vertical storage.

B. Performance: See Schedule on Plans.

C. Tank:
   1. Glass lined welded steel,
   2. Meets thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IESNA 90.1.

3. Comply with the Federal Energy Conservation Standards effective April 16, 2015, in accordance with the Energy Policy and Conservation Act (EPCA).
4. Encased in corrosion-resistant steel jacket with baked-on enamel finish.
5. Meets UBC, CEC and HUD National Codes.

D. Corrosion-resistant steel jacket; baked-on enamel finish.

E. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.

F. Provide with the following accessories:
1. Heat Traps
2. Water Connections: Brass.
3. Dip tube: Brass.
4. Drain Valve.
5. Anode: Magnesium
6. Temperature and Pressure Relief Valve: ASME-rated.

2.3 COMMERCIAL ELECTRIC WATER HEATERS

A. Type: Factory-assembled and wired, electric, vertical storage.

B. Performance: See Schedule on Plans.

C. Maximum working pressure: 150 psig.

D. Electrical Characteristics: See Schedule on Plans.

E. Tank: Glass lined welded steel, ASME rated, with 4” diameter inspection port, thermally insulated with minimum 2” insulation, encased in corrosion-resistant steel jacket with baked-on enamel finish.

F. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nickel chrome elements, high temperature limit thermostat.

G. Provide with the following accessories:
1. Temperature and Pressure Relief Valve: ASME rated.

2.4 CERTIFICATIONS

A. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gages.

B. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with corrosion-resistant metal alloy, rated less than 75 watts per square inch.

2.5 WATER HEATER DRAIN PAN

A. Provide drain pan under all water heaters, constructed of plastic or aluminum. Pan to be 2" larger minimum each direction than the tank, 2.5" deep with top edge hemmed over for safety and strength. Pan is to be large enough to encompass the circulation pump and expansion tank when water heater is located on the second floor or higher.

B. Provide a pan drain connection, located as close to the bottom of the pan as possible. Provide sloped drain piping to nearest floor drain, floor sink, or as shown on Plans.

2.6 DIAPHRAGM-TYPE DOMESTIC WATER COMPRESSION/EXPANSION TANK

A. Manufacturers:
1. Amtrol Inc.
2. Armstrong
3. ITT Bell & Gossett
4. Taco, Inc.
5. Approved equal.

B. Construction: Welded steel, rated for working pressure of 150 psig, with flexible EPDM or butyl rubber diaphragm sealed into tank, and steel legs or saddles. Tank shall be suitable for Potable Water Systems.

C. The tank shall be constructed, tested and stamped in accordance with Section VII, Division 1 of the ASME Code. All welds to conform to ASME Section IX.

D. The water connection shall be 304L Stainless Steel with a circulation device inserted to encourage reduction of stagnant water within the tank water chamber.

E. The internal water chamber shall include a molded polypropylene liner with a silver-ion based antimicrobial compound; tested to Standard JIS Z 2801 for efficacy in the reduction of Legionella (L. pneumophila). Staphylococcus (S. aureus) and Coliform (E. coli) bacteria on its surface

F. Tanks shall carry NSF Standard 61 and IAPMO Lead-Free listings.

G. Accessories: Pressure gage and air-charging fitting, tank drain.

H. Precharge to 50 psig.

I. Thermal expansion tank size shall be as shown on Schedule on Plans.

2.1 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. Armstrong Pumps Inc.
2. ITT Bell & Gossett
3. Grundfos
4. Taco, Inc.
5. Approved equal.

B. Construction
1. Pump Body: Certified Lead-Free Bronze or stainless steel
2. Impeller: Poly-phenylene Sulfide or Bronze
3. Shaft: AISI 420 Stainless Steel
4. Bearing: Carbon Sleeve
5. Gasket/O-Ring: EPDM
6. All Other Wetted Parts: AISI 304 Stainless Steel
7. Motor Type: Electronically Commutated Motor
8. Motor Insulation Class: F

C. Standard control modes
1. Proportional pressure control
2. Constant pressure control
3. Manual set constant speed.

4. Night mode
5. Set Point Temperature control
6. Advanced settings can be managed from a PC, tablet or smartphone, and are accessible via optional built-in Wi-Fi or Ethernet cable.
7. Multiple inputs including start-stop, temperature control, pressure regulation and advanced Modbus or BACnet control provide dynamic system management.
8. An external temperature probe can be added for more advanced Delta T control.

D. Performance: See Schedule on Plans.

2.2 Elevator Sump Pump System

A. Manufacturers:
1. Stancor Oil Minder SE
2. Approved equal.

B. Description: Submersible type pump with control panel, oil switch and liquid sensor. Compliant with ASME A17.1 Elevator Code.

C. Pump:
1. Casing: One piece cast iron volute type.
2. Impeller: Cast iron, semi-open, non-clog type, dynamically balanced.
3. Shaft Seal: Mechanical with silicon carbide seal lower seal and carbon ceramic upper seal faces. 300 series stainless steel metal parts, BUNA-N elastomers.
4. Bearings: Upper and lower ball bearings.
5. Motor: Fully submerged type with Class E insulation. Corrosion-resistant, stainless steel shaft. Built-in overload with automatic restart. UL 778.
6. Power Cord: Severe duty rated, oil and water resistant. Epoxy seal on motor end. NEMA 3 prog grounding plug for motors 1 HP and smaller and bare lead cord ends for pumps 1-1/2 HP and larger. UL approved cable. Power to the pump to be supplied through the control panel to eliminate the need to have an outlet in the pit. Length to suit installation of system components.
7. Sump: The system - including pumps 1 HP and smaller, oil probe and floats – shall fit within a 24” x 24” x 24” sump.

D. Control Panel: NEMA 4X corrosion resistant polycarbonate enclosure with hinged door. Control panel shall be factory wired (pump, oil probe and floats) to the 8-pin twist-lock waterproof electrical receptacle. The control panel shall have a warning horn with illuminated red light and alarm silencing switch. Control panel shall include self-test button that exercises the system and ensures proper installation by running pump and sounding audible alarm when activated. Include output connection for high water annunciation to Direct Digital Control (DDC) system.

E. Junction Box: NEMA 4X corrosion resistant polycarbonate enclosure with hinged cover. Junction box shall be factory wired pump, oil probe and floats and include an 8-pin twist-lock electrical receptacle to connect to the control panel. All cables between the pump and junction box shall be 16’ long.

F. Pump Control Float: Include factory mounted Pump On and Pump Off floats. UL 508.

G. Oil Sensor: Solid state, low voltage sensing device that differentiates between oil and water. Sensor shall be factory mounted and include self-cleaning functionality to ensure contaminants from oil exposure will not impair sensor performance. Optical sensing systems are subject of contamination and are not considered equal. System shall continue to pump out water down to the oil level. System shall not pump oil into the piping system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. A separate switch shall be provided to permit turning off the energy supplied to electric service water heating systems.

B. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

C. Sump Pumps:
1. Ensure shaft length allows sump pumps to be located minimum 24" below lowest invert into sump pit and minimum 6" clearance from bottom of sump pit.
2. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
3. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4" and over.
4. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
5. Align and verify alignment of base mounted pumps prior to start-up.

D. Anchor and/or strap water heaters to resist displacement due to earthquake motion. Contractor to determine extent of bracing required, based on actual location and adjoining equipment and/or piping.

3.2 SYSTEM STARTUP

A. Provide the services of a manufacturer's field representative for starting and testing equipment.

B. Prepare a manufacturer’s startup report and submit to the Owner’s representative and Commissioning Agent.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing Fixtures.

B. Fixture Carriers.

C. Faucets and Trim.

D. Water Efficiency Standards

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Domestic Water Piping.

B. Section 22 10 06 - Domestic Water Piping Specialties

C. Section 22 13 16 - Sanitary Waste, Vent Piping, and Storm Piping

D. Section 22 13 19 - Sanitary and Storm Piping Specialties

E. Section 22 30 00 - Plumbing Equipment

1.3 REFERENCE STANDARDS

A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.

B. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.

C. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers.

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers.

E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers.

F. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers.

G. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers.

H. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Manufacturer's Instructions: Indicate installation methods and procedures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. All Plumbing Fixtures in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards, or be NSF-61-G certified to all requirements of NSF/ANSI 61 (health effects) and all requirements of Annex G and NSF/ANSI 372 (lead content) via third-party testing and certification.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. Manufacturers: The following manufacturers' products are approved. Select products and provide submittals to suit specific requirements of Specifications and Plans.

1. Acorn
2. American Standard
3. Aquatic
4. Beneke
5. Brasscraft
6. Brocar Products, Inc.
7. Chicago Faucets
8. Church
9. Delaney
10. Eastman
11. Eljer
12. Elkay
13. Fiat
14. Fiber-Fab
15. Freedom Shower
16. Guy Gray/IPS
17. Halsey Taylor
18. Haws
19. Jay R. Smith
20. Josam
21. Just
22. Kohler
23. Mansfield
24. McGuire
25. Mifab

26. Mustee
27. Oasis
28. Olsonite
29. Precision Plumbing Products
30. Sloan
31. T&S Brass
32. Truebro, Inc.
33. Wade
34. Watts
35. Zurn
36. Approved equal

B. Fixtures are specified in the plumbing fixture schedule, followed by the catalog designation of the listed manufacturers. Similar fixtures of equal quality and type from manufacturers listed above are acceptable alternates subject to final approval.

C. All fixtures shall be Watersense labeled.

D. Fixtures shall be new, free from flaws and blemishes with bright, smooth surface. All vitreous ware shall be non-absorbent, even color, unwrapped, two-fired china. Enameled ironware shall be acid resisting porcelain enameled cast-iron.

E. Flush valves shall be Sloan Royal models as listed in the fixture schedule. Similar flush valves of equal quality and type manufactured by Delaney or Zurn are acceptable alternates.

F. Water closet seats for other than residences shall be open front, less cover, with concealed stainless steel, self-sustaining check hinge and shall be sized to fit bowl size of water closet specified.

G. Fixtures shall be white unless noted otherwise.

H. All handicapped-accessible plumbing fixtures shall comply with the American With Disabilities Act (ADA) standards and procedures latest effective date. This Contractor shall verify these requirements with each manufacturer specified or acceptable alternate prior to the submittal process. All handicapped lavatories and sinks shall be provided with offset-type tailpieces.

I. Handicapped-accessible sinks shall meet the size requirement below and shall comply with the American With Disabilities Act (ADA) standards and procedures latest effective date. The depth of the sinks shall be no more than 6-1/2", the front to back shall be no more than 19-1/2", the left to right dimension may vary. See the Plumbing Fixture Schedule on the drawings. If the scheduled sink is greater than the dimensions listed above, the MC shall coordinate the larger sink sizes with the Owner’s representative and GC prior to ordering.

J. All Plumbing Fixtures in contact with potable water shall be certified lead free (less than 1/4 of 1%). Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.

K. Flush control for manual handicapped water closets shall be mounted for use from wide side of the water closet area.

L. P-traps: P-traps shall be chrome-plated cast brass body with cleanout, 17 gauge seamless tubular wall bend with cast brass slip nuts. Trap shall be certified by

CSA or other recognized testing authority. P-trap shall bear manufacturer and testing mark. P-traps shall be McGuire, Eastman, or approved equal.

M. Plumbing Fixture Schedule: See Schedule on Plans.

2.2 FIXTURE CARRIERS

A. Manufacturers
1. Jay R. Smith
2. Josam
3. Mifab
4. Wade
5. Watts
6. Zurn
7. Approved equal

B. Provide carrier types noted for the plumbing fixtures listed. Check and verify plumbing chase requirements with Plans. Provide back-to-back carriers where back-to-back fixtures are shown. Where floor mount carriers are called for, anchor foot assembly to floor per manufacturer's written instructions. Floor-mounted single water closet carriers shall be back-bolted to the floor with two bolts via factory-provided bracket. Loose carriers will require re-working at the Mechanical Contractor's expense.
1. Water Closet: Adjustable horizontal above floor or compact vertical carriers. Carrier shall be rated for 500 pounds. See plans and riser diagram for type of carrier required. Equal to Zurn Z1203-ND4, Z1203-N4, Z1204-ND4, Z1204-N4.
2. Urinals: Floor mounted with bearing plate.
3. Lavatories: Floor mounted with concealed arm carriers or exposed arm carriers, see schedule.

2.3 FAUCETS AND TRIM

A. Manufacturers
1. Elkay
2. Delta
3. Chicago Faucets
4. T&S Brass
5. McGuire
6. Brasscraft
7. Approved equal

B. Faucets and other trim shall be as listed in the Plumbing Fixture Schedule Similar faucets and other trim of equal quality and type from manufacturers listed above are acceptable alternates subject to final approval.

C. All fixtures shall be Watersense labeled.

D. Provide all plumbing fixtures complete with all fittings, stops, risers, accessories, connections to waste, hot and cold water and /or flush connection as required to make each individual "P" unit pursuant to Plans a completely finished and working plumbing fixture.

E. All trim and exposed piping shall be chrome-plated brass. Supplies, wastes and traps in cabinets or under counters shall be considered exposed to view.

F. All faucets shall have ADA-acceptable handles, even if the fixtures are not designated as ADA.

G. Piping for flush valves shall be anchored to prevent movement in the wall. Products such as Holdrite 114-C shall be acceptable for use with water closets.

H. Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.

I. Provide insulation on exposed hot water supply, cold water supply and waste piping to ADA lavatory and ADA sink fixtures.
   1. Manufacturers
      a. Brocar Products, Inc.- Trap Wrap
      b. Truebro, Inc. - Handi-Lav-Guard
      c. McGuire - ProWrap
      d. Zurn ADA Products
      e. Approved equal.

2.4 WATER EFFICIENCY STANDARDS

A. All plumbing fixture water usage flow rates shall be in full compliance with the latest Washington State amendments to the Uniform Plumbing Code and/or requirements of local jurisdictions, whichever is more restrictive. Where more restrictive flows are shown on the Plumbing Fixture Schedule, these requirements shall take precedence.

B. All fixtures shall be Watersense labeled in accordance with ESDS requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

B. Handicapped Mounting Heights:
   1. Water Closets: Mounting height from floor to top of seat shall be a maximum of 19" and a minimum of 17".
   2. Urinals: Front lip of basin shall not exceed 17" above finished floor.
   3. Lavatories: Lavatory rim or counter surface shall not be higher than 34" above the finished floor.
   4. Mechanical Contractor to coordinate mounting heights with the Architectural Drawings and applicable codes for both ADA and standard fixtures.

3.3 INSTALLATION

A. Install each fixture with trap easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or braided stainless steel flexible supplies to fixtures with loose key stops, quarter-turn ball valves, reducers, and escutcheons. Where chrome-plated pipe and fittings are not available, typically commercial-type kitchen equipment installation, paint the pipe and fittings with chrome paint or provide stainless steel drain pipe and fittings.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant adhesive caulk, color to match fixture.

F. Install each fixture in accordance with architectural details. Unless otherwise noted, each fixture shall be located symmetrically, with its center line congruent with the center of windows, stall spaces, wall spaces, or casework. Unless noted otherwise, mounting height of fixtures shall be in accordance with the manufacturer's rough-in Standards.

G. Provide escutcheon plates for all lines through the walls and floors.

H. Attach floor-mounted water closets to the floor with solid brass closet bolts, not brass plated.

I. Connect hot water circulating piping to hot water piping within 24” of plumbing fixtures. Bring circulating piping down into wall as needed to meet this distance requirement.

J. The Electrical Subcontractor shall provide all power wiring and low voltage wiring to flush valves and other fixtures as needed. The Mechanical Contractor shall provide flush valve trim and any transformers needed. Mechanical and Electrical subcontractors to coordinate prior to starting rough-in.

K. Install carrier bolts in cured concrete only; test and prove to the Owner’s representative that all carrier bolts are secured in the floor. On the second floor and above, through-bolt the carrier feet with longer bolts, 2" x 2" heavy square washers, lock washers and double nuts. Contractor is responsible for following the manufacturer’s installation requirements and the installation results.

L. Test all Emergency fixtures for flow and temperature and give test results to engineer.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures so as to prevent splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

END OF SECTION

SECTION 23 00 10

GENERAL HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC) REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, and Division 01.

B. This section of the specification applies to the entire mechanical work, both interior and exterior, as specified herein after and shown on the plans.

1.2 SCOPE

A. Provide heating, ventilating, and air conditioning equipment, piping, ductwork, etc. as shown on Plans and as described in contract documents.

1.3 DEFINITIONS

A. The term "approved equal" means final approval by the Owner's representative of a material or piece of equipment substituted for that which is shown in the specifications or plans.

B. The term "provide" means the furnishing and installing of equipment (including connections and appurtenances) complete and ready for use.

C. The term "Mechanical Contractor (MC)" and "Electrical Contractor (EC)" as used in these Specifications or on the Contract Drawings, refers to those subcontractors working under the direction of the "General Contractor (GC)."

1.4 INTENT OF DRAWINGS

A. The drawings are diagrammatic and do not show the exact details and locations, nor all offsets in ductwork and piping. Contractor shall provide additional fittings, offsets and extensions in piping, ductwork and related mechanical insulation as required to meet the intent of the documents. Contractor shall include in his bid provisions to relocate or shift piping and ductwork where conflicts exist with Structural, Architectural, or Electrical.

B. Refer to the complete set of Architectural, Structural, Electrical, and Civil Plans and Specifications for additional details of the work. Review Plans and Specifications of other trades to identify other requirements. Discrepancies shall be reported to the Owner's representative immediately before ordering material or beginning work.

1.5 COORDINATION

A. Examine the complete set of drawings including all disciplines before work is started. Consult with each of the other Contractors regarding locations and spaces required for work and lay out work to avoid interference. Maximum clearance shall be maintained for service access and maintenance of all equipment. Failure to coordinate shall be justification to require Contractor, at his own expense, to move his work to provide the necessary space for the other contractors.

B. Mechanical systems have space priority as follows, listed with highest priority first: Graded Drainage Piping, then Ductwork, Drainage Vents, Domestic Water Piping,, and Fire Protection Piping. MC to make certain that priority access is maintained. This shall be coordinated by the GC and MC without assistance from Owner's representative, Engineer, or Architect.

C. Contractor shall be responsible for his own coordination between all other trades. Development of Shop Drawings shall be a collaborative effort between the General Contractor, Mechanical Contractor, Electrical Contractor and all other subcontractors working on the project. Shifting of piping, ductwork and other mechanical items shall be the responsibility of the Team to maintain the intent of the documents. Submit shop drawings to the Owner's representative.

1.6 WORK IN OTHER SECTIONS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.7 CODES AND REFERENCES

A. Codes and Standards listed shall be the most current issue as adopted by the Local Jurisdiction. In the event of a conflict of codes, the most stringent code will apply.
   1. International Building Code (IBC)
   2. Uniform Plumbing Code (UPC)
   3. International Mechanical Code (IMC)
   4. Washington State Energy Code
   5. SMACNA Duct Construction Standards, Metal and Flexible
   6. National Electrical Code (NEC)

1.8 PERMITS AND FEES

A. Obtain and pay for all permits, licenses and construction or utility fees. Furnish final certificate to Owner showing compliance with code requirements.

1.9 SCHEDULING

A. Comply with requirements of General Specifications.

1.10 PRIOR APPROVALS

A. Specifications have been written around equipment and material selected for this project based on quality, size, capacity, and performance required to meet building design criteria. Any equipment and/or material used in this project, that is not as specified, must have prior approval from the Owner's representative.

B. Request for Approval must be submitted with substitution request form included in Division 0 to Owner's representative, a minimum of 10 calendar days prior to bid date. This letter shall be accompanied with complete information regarding items to be substituted.

C. Those items that receive prior approval, will be listed in the Mechanical Addenda.

D. Supplier, and/or Mechanical Contractor, shall be responsible for ensuring that substituted material or equipment is of the same size, quality, capacity, weight, and electrical characteristics as that specified. Any changes and costs required

during construction, due to contractor's/supplier's neglect to properly select substituted equipment, shall be paid by the contractor/supplier.

E. Prior approval to bid does not mean automatic final approval of material or equipment by the Owner's representative. Final approval will be given after final submittal data has been presented to Owner's representative, with complete information regarding weights, capacities, size, electrical requirements and quality.

1.11 MATERIAL AND MATERIAL SUBMITTALS

A. All material used on the project shall be new material and free from defects. This Contractor shall submit catalog data and engineering data on all equipment as specified or having received prior approval.

B. Material and equipment specified is designated by various manufacturer's catalog numbers. Acceptable alternate manufacturers are also listed. Such manufacturers are exempt from the 10-day prior approval clause of these specifications, but must submit standard submittal data for final approval as otherwise noted.

C. Submittal shall be arranged in numerical order, according to specification section number and item number. Submittal shall be in PDF format complete with labeled bookmarks (minimum one per specification section).

D. Submittal shall be as follows: Before ordering or installing any of the materials, this Contractor shall submit copies of complete information on the materials to be used on the project. Submittal shall include, but not be limited to, the following.
   1. Contractor's Cost Breakdown
   2. Complete List of Subcontractors and Suppliers
   3. HVAC Insulation
   4. All Air-Handling Equipment
   5. Heat Pumps
   6. Electric Duct Heaters
   7. Air Terminals
   8. Air Filters
   9. HVAC Ductwork
   10. Tests and Adjustments - Balancing
   11. Controls

E. Owner's representative's review of submittals is for general conformance with the design concept and Contract Documents. Marking or comments shall not be construed as relieving the Contractor from compliance with the project Plans and Specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy for confirming and correlating all quantities and assembly and for safe performance of his work.

F. The Owner's representative will return one set of this submittal to the contractor showing any corrections, additions, and/or deletions. This Contractor shall resubmit those items that need to be corrected or added.

1.12 CONTRACTOR'S COST BREAKDOWN

A. Mechanical Contractor shall submit, with the submittals, a cost breakdown of the major portions of his work, pursuant to the following outline.
   1. Job organization and submittals.

2. Outside site utilities.
3. HVAC Equipment, including air handling units, heat pumps, heat exchangers, boilers, cooling towers/fluid coolers, fans and heating circulation pumps.
4. HVAC ductwork and air terminals.
5. HVAC piping and insulation.
6. HVAC specialties
7. Tests and adjustments
8. Controls
9. Commissioning

1.13 RECORD (AS-BUILT) DRAWINGS

A. This Contractor shall maintain a set of Contract Drawings at the site on which the actual installed location of piping, equipment, etc., shall be shown in a legible, neat manner. This set of plans shall show actual dimensions (including depth of bury) of underground piping from construction lines, so they can be readily found after covering. Upon completion of the project, the as-built information shall be transformed into AutoCAD version 2018 or greater. Record drawings shall be the same size as contract drawings. This set of plans shall be submitted for final approval. Drawings shall be one full size set, one half size set and on a USB flash drive in PDF and .dwg format. The contractor shall be ready for review of the on-site as-builts monthly prior to submitting his billing. Failure to have drawings available for review may delay monthly billings.

1.14 OPERATING INSTRUCTIONS

A. Operate all systems through complete cycles in the presence of designated Owner's representative. Give instructions for operation, care and maintenance. All systems shall be operated through complete operating cycles for a minimum period of 7 days in conjunction with the designated Owner's representative before acceptance.

1.15 TRAINING

A. The Mechanical Contractor shall digitally record all Owner Mechanical training sessions and shall provide copies on USB flash drives. Training sessions shall be provided for all mechanical systems. Three copies of these USB drives shall be turned over to the Owner at the completion of the project.

1.16 OPERATION AND MAINTENANCE MANUALS (O&Ms)

A. General: Provide one preliminary searchable PDF set of Operation and Maintenance Manuals including maintenance information and parts list furnished by the manufacturer with the equipment, together with supplementary drawings where necessary, to itemize serving and maintenance points. Include the Valve Tag list as posted in the Mechanical spaces. Filter list shall include all sizes and quantities for each unit and recommended filter maintenance schedule. Include methods of operation, seasonal requirements, manufacturer's data and warranty forms. Warranty forms are to be located in the front of the manuals as well as in each applicable specific section. Provide address and 24-hour phone number of the firms responsible under warranty. Items requiring service or correction during the warranty period shall be serviced within 24 hours of notification by Owner. Data in manuals shall be neat, clean copies, with operation and maintenance

instructions for each item of equipment installed. Drawings shall be accordion folded. An index shall be provided with all contents listed in an orderly presentation with bookmarks according to specification section.

B. Number of Copies: A preliminary set of the O&M Manuals shall be submitted for approval. After this set has been approved, one hard copy and 3 electronic copies on USB flash drives shall be submitted.

C. Hard Copy Binding: Organize operating and maintenance data into suitable sets of manageable size. Copies shall be submitted in 3-ring binders. Covers shall include the name of the Job, Owner, Architect, Engineer, Contractor, and the year of completion. The back edge of the binder shall include a label with the name of the Job, the Owner and the year completed. Each copy shall have a typewritten index and tabbed dividers between equipment categories. Binders to be no more than 80% full; binders that are over 80% full will be sent back for dividing into additional binders.

1.17 CERTIFICATIONS

A. Provide written certification that work has been fully completed in strict accordance with Plans and Specifications and request final inspection.

B. Provide written certification that Contractor will replace materials and workmanship that prove defective for one (1) year after date of acceptance or extended warranty as listed in individual sections.

C. Provide written certification of inspection from the Authority Having Jurisdiction, stating that all work has been inspected, accepted, and approved as complying with existing governing ordinances and codes.

D. Provide written certification that Owner's representative has been fully instructed in the operation and function of all mechanical systems.

E. Provide copies of certification in the O & M Manuals.

1.18 DOCUMENTS

A. Present the following documents to the Owner's representative prior to final acceptance of buildings. Final payment of the Contract will be contingent upon receiving these documents:
   1. Record (as-built) drawings.
   2. Operation and Maintenance Manuals (3 sets).
   3. Final material submittal.
   4. Warranties and Extended Warranties.
   5. Approved Final Balancing logs.
   6. State of Washington certification of all pressure vessels installed on the project. Affix a copy to each tank.
   7. Final certificates of inspection and code compliance.
   8. RPBF device tests.
   9. All applicable forms required by these specifications.
   10. Provide copies of the above documents in O & M Manuals.

1.19 WARRANTY

A. All mechanical equipment and systems including Heating, Ventilating, and Air Conditioning systems, including controls and all parts thereof, shall be warranted

(parts and labor), for a period of one (1) year after the date of substantial completion as determined by the documentation.

B. Contractor shall repair or replace to the satisfaction of the Owner's representatives any defective material, equipment, or poor workmanship, which may show itself during this warranty period.

C. All compressors used in HVAC equipment shall have an additional four-year parts warranty.

D. Controls shall be warranted for two (2) years total parts and labor, from date of final acceptance.

E. Test and Balance shall be warranted for two (2) years total, from date of final acceptance.

1.20 REQUIREMENTS PRIOR TO OCCUPANCY - OFF-GASSING AND BAKE-OUT

A. Mechanical Contractor shall provide in his bid provisions for Off-Gassing and Bake-out of new materials installed in this contract. HVAC systems shall be run continuously for a minimum of two (2) week period prior to occupancy, at the completion of each area of the project. HVAC systems shall maintain a constant temperature of 70 to 78 degrees F, in all zones at 60% minimum outside air. Coordinate this requirement with the General Contractor.

1.21 MECHANICAL ACOUSTICAL REQUIREMENTS

A. The noise criteria (NC) end resultant for each space shall be per Code as adopted by Local Jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUBMITTAL

A. Owner's representative's review of submittals is for general conformance with the design concept and Contract Documents. Marking or comments shall not be construed as relieving the Contractor from compliance with the project Plans and Specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy for confirming and correlating all quantities and assembly and for safe performance of his work.

END OF SECTION

SECTION 23 00 20

BASIC MATERIALS AND METHODS FOR HEATING, VENTILATING, AND AIR-CONDITIONING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. General requirements for basic materials and methods.

1.2 REFERENCES

A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

B. "Seismic Restraint Manual Guidelines for Mechanical Systems" by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

PART 2 - PRODUCTS

2.1 GENERAL

A. See specific sections for this requirement.

2.2 PRODUCT TESTING

A. Any piece of equipment used in this project and hereinafter specified which, by its nature, requires electrical connection, such as fans, pumps, air handling equipment, etc., must be provided with an approval label from one of the agencies hereinafter listed.

B. Approval of agency must be for the total package; approval of individual components not acceptable. All labels must be located outside of equipment and shall be visible to inspector. Comply with all requirements of RCW 19.28.010 and NEC Sections 90-7 and 110-3 (1993).

C. It shall be the responsibility of the Mechanical Contractor or the equipment supplier to meet the requirements of this section. Any agency costs to provide an appropriate label for a piece of equipment must be included in this bid. Failure by Mechanical Contractor or supplier to obtain approval labels prior to bid shall be sufficient cause for the Mechanical Contractor/supplier to obtain all such labels at no additional cost to Owner. The following is a list of approval testing laboratories:
   1. Underwriters Laboratories, Inc., www.ul.com
   2. Canadian Standards Association, www.csagroup.org
   3. American Gas Association, www.aga.org.
   4. Factory Mutual Systems, www.fmglobal.com
   5. MET Electrical Testing, www.metlabs.com
   6. Intertek Testing, www.intertek.com

2.3 PRESSURE VESSELS

A. At the completion of the project, the Contractor shall provide State of Washington Certification of all pressure vessels installed on the project. Affix certification on the vessels and provide a copy to the Owner in the O & M Manual.

2.4 DAMAGED OR REJECTED MATERIALS

A. Remove from the site immediately.

2.5 STARTERS, DISCONNECTS AND VFDS

A. All starters shall be provided and installed by Electrical Contractor unless otherwise noted.

B. All disconnects shall be provided and installed by Electrical Contractor unless otherwise noted.

C. VFDs shall be provided by the Control Contractor, installed by the Electrical Contractor, and controlled by the Control Contractor unless otherwise noted.

D. Mechanical Contractor shall coordinate VFDs, based on direction provided in the Contract Specifications. All VFDs are to be of a single manufacture and/or provided by a specific contractor. The MC shall be responsible for compliance with the specification or shall correct problems at his expense.

E. The Mechanical Contractor shall coordinate with the Electrical Contractor and provide voltage, phase, horsepower, and amperage for all of the mechanical equipment being provided, based on approved submittals and the actual equipment being provided.

F. Starters, disconnects, and VFDs shall be provided in a timely manner, so as to not delay the Electrical Contractor's work.

2.6 FIRE INTEGRITY

A. Manufacturers
   1. 3M Fire Products
   2. Holdrite
   3. Approved equal

B. The penetration sealing systems shall be provided with F-Rating and/or T-Rating as required by IBC Section 714.3 and 714.4 Penetrations include the following:
   1. Through-penetration firestopping in fire-rated construction.
   2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction.
   3. Construction-gap firestopping occurring within fire-walls, floor or floor-ceiling assemblies.
   4. Construction-gap firestopping in smoke partitions.
   5. Through-penetration smoke stopping in smoke partitions.
   6. Construction-gap smoke stopping in smoke partitions.
   7. All ductwork and piping penetrating mechanical spaces, mechanical mezzanines, mechanical lofts, mechanical boiler rooms, or other mechanical spaces, shall be fire caulked, even if the walls are not rated. Visible piping penetrations shall be covered by split chrome-plated floor and ceiling plates. Visible ductwork penetrations shall be covered by painted angle-iron frames.

C. All products shall be listed in Underwriters Laboratory Fire Resistance Directory. Firestopping for penetrations and voids shall be UL-tested systems.
   1. Through-penetration firestop devices (XHCR).
   2. Fire resistance ratings (BXUV).
   3. Through-penetration firestop systems (XHEZ).
   4. Fill, void or cavity material (XHHW).

D. All material shall be tested per American Society for Testing and Material Standards, ASTM E814: Standard test method for fire tests of through-penetration firestops.

E. Firestopping for penetrations and voids shall be UL-tested systems.

2.7 HANGERS

A. Manufacturers:
1. Grinnell
2. Michigan Hanger
3. Tolco
4. PHD
5. Anvil
6. Holdrite
7. Approved equal

B. Provide all anchors, hangers and all supports for piping and equipment included in contract.

C. It is the responsibility of the Contractor to provide an adequate pipe suspension system in accordance with recognized engineering practices, using standard, commercially-accepted pipe hangers and accessories.

D. All pipe hangers and supports shall conform to the latest requirements of ASME B31.1 Code for Pressure Piping, and Manufacturers Standardization Society Documents MSS SP-58 and MSS SP-69.

2.8 INSERTS AT HANGERS AND SUPPORTS

A. Manufacturers:
1. Holdrite
2. Buckaroos
3. Cooper
4. Metro Supply Company
5. Value Engineered Products, Inc.
6. Hydra-Zorb Klo-Shure 7-series or 8-series strut-mount and Clevis
7. Approved equal

B. Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. The insert is to consist of either hydrous calcium silicate or polyisocyanurate foam insulation (urethane) encircling the entire circumference of the pipe with a 360-degree PVC (1/16” thick) or galvanized steel jacket (20 gauge minimum). Inserts are to be installed on piping during piping installation, by the Piping Contractor. Provide continuous insulation vapor barrier. Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor retarder mastic.

C. For elastomeric insulation, provide Hydra-Zorb Klo-Shure 7-series 8-series strut-mount or Clevis Hanger Insulation Couplings or approved equal.

D. Insulation and covering shall meet the flame spread index and smoke developed index as noted in the International Building Code.

E. Insert thickness shall match Code-required insulation thickness as a minimum.

F. Provide pipe covering protection saddle for piping on rollers; Anvil figure 160 through 166A or approved equal.

G. Inserts for piping in plenums shall have appropriate flame/smoke spread rating.

2.9 SUPPORT FOR ROOF-MOUNTED PIPING

A. Manufacturers
1. Blox
2. Dura-blok
3. Mifab
4. Approved equal

B. For piping run across roof areas, provide the following support system, detail the type and locations of the different configurations required, and submit for approval prior to starting work:

C. Mount on roof per manufacturer's recommendation; do not penetrate the roofing material. Receive approval from the roofing contractor before gluing down bases. Support bases are to be installed per manufacturer’s installation instructions.

D. Do not exceed support assembly weight limits or that of the roof. Coordinate with the Architect and GC prior to installing the specified system.

E. Secure piping to the support system.

2.10 SUPPORT FOR ROOF-MOUNTED Ductwork

A. For ductwork run across roof areas, provide an adequate support system (in accordance with SMACNA) with anchors to the roof structure below, detail the type and locations of the different configurations required, and submit for approval prior to starting work:

B. Mount on roof per manufacturer's recommendation

C. Do not exceed support assembly weight limits or that of the roof. Coordinate with the Architect and GC prior to installing the specified system.

D. Secure ductwork the support system.

E. Patch and seal roofing.

2.11 ELECTRIC MOTORS

A. Minimum efficiencies of electric motors shall comply with the Washington State Energy Code.

B. For VFD applications, provide motors rated for VFD service (inverter ready) only.

2.12 ACCESS DOORS AND PANELS

A. Manufacturers:
1. Jay R. Smith
2. Milcor
3. Mifab
4. Approved equal.

B. 16 gauge steel door and frame with concealed hinge and cylinder lock. Provide matching latches/locks keyed the same for multiple panels in a project. When "B" dimension is 24" or more, provide additional latches at the top and bottom of door. Provide finish and material as noted in Part 3 – Execution.

2.13 CONCRETE INSERTS

A. Manufacturers:
1. Grinnell
2. Kinsdorf
3. Elcen
4. Approved equal.

B. Inserts in concrete for the suspension of piping and equipment shall be provided by this Contractor, unless otherwise noted on the Plans. Inserts in "poured-in-place" concrete shall be Grinnell 282 galvanized, or approved equal.

2.14 VIBRATION ISOLATION

A. Manufacturers:
1. Kinetics Noise Control, Inc.
2. Mason Industries
3. Amber-Booth
4. I.S.A.T.
5. Flexicraft
6. Twin City Hose
7. Approved equal.

B. General
1. If equipment is internally isolated by the manufacturer, internal isolation (base and isolator) shall be equivalent to the scheduled base and isolator and the isolator shall meet the scheduled spring static deflection.
2. Size anchoring bolts to withstand lateral seismic shear and isolate bolts from direct contact with structure using bolt isolation washer and bushing.
3. Bases specified in the schedule can be supplied by the manufacturer of the equipment if they meet the specification given herein.
4. Electrical connections shall be made with floppy length of flexible cable.
5. Piping in connected to vibrating equipment shall be supported from resilient ceiling hangers or from floor mounted resilient supports.

C. Pipe Isolation - General
1. Hung Type Isolators: Double-Deflection Neoprene Hanger to 4", Deflection - 30 degree Swing Spring and Double Deflection Neoprene Hanger - 6" and larger.
2. Isolator Deflection: 1/4” to 4", 1" - 6" and larger.
3. Motion Restraint Snubber: seismic restraint cable, rod clamp for standard 1-5/8" x 1-5/8" unistrut, and clevis cross brace.

D. Piping not requiring sway bracing is as follows:
1. Piping in mechanical spaces less than 1".
2. All other piping less than 2-1/2".
3. Piping suspended by hangers 12" or less in length measured from the top of the pipe to bottom of hanger support where the hanger is attached.

E. Air Handling Unit or Inline Fan - Up to 5000 CFM
1. Base Type: Integral structural steel base. Structural steel support members with welded-on isolator support brackets and pre-located and drilled anchor bolt holes, supplied by the equipment manufacturer with the equipment.
2. Hung Type Isolator: 1" Deflection - 30 degree Swing Spring and Double Deflection Neoprene Hanger.

3. Floor Type Isolator: 1" Deflection - housed/restrained cast open-spring isolators.
4. Flex Connector: Flexible duct connection manufactured from UL listed fire-retardant neoprene-coated woven glass fiber fabric to NFPA 90A, with minimum density of 30 ounces per square yard.
5. Motion Restraint Snubber: Seismic Restraint - Cable.

F. Air Cooled Condensing Units
1. Base Type: Integral structural steel base. Structural steel support members with welded-on isolator support brackets and pre-located and drilled anchor bolt holes, supplied by the equipment manufacturer with the equipment.
2. Floor Type Isolator: Neoprene waffle pads, 40 durometer hardness, minimum1/2"; maximum loading 60 psi.
3. Flex Connector: Flexible pipe connection for refrigerant piping; see Section 23 23 00.
4. VRF Outdoor Roof mounted units: Provide with 1" Deflection - seismic and restrained/captive-spring isolators with neoprene cushion.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

A. Locate all general reference points as established by the General Contractor and take such action as is necessary to prevent their destruction; lay out work and be responsible for all lines, elevations, grading for utilities and other work executed under the Contract. Exercise proper precautions to verify figures shown on drawings, before laying out work and be responsible for any errors resulting from failure to exercise such precaution. The coordination of the utility installation with the final site grading and elevation by the General Contractor shall be the responsibility of this contractor. Locate existing utility lines which will be affected by the building location before any footing work begins. Report conflicts with the Plans to the Owner's representative for adjustment before proceeding with the work. Failure to follow this instruction will result in the contractor being required to alter his work at his own expense.

3.2 ELECTRICAL WORK

A. All electrical work performed under this Section of the Specifications shall conform to all applicable portions of the Electrical Section of the Specifications, and shall conform to all applicable codes.

3.3 WORKMANSHIP

A. Furnish and install all equipment for a neat and finished appearance. If, in the judgment of the Owner's representative, any portion of the work has not been installed in a workmanlike manner, or has been left in a rough, unfinished manner, Contractor will be required to remove and reinstall the equipment, and patch and paint surrounding surfaces in a manner satisfactory to the Owner's representative, without any increase in cost to the Owner.

3.4 EXCAVATION - GENERAL

A. Perform all necessary excavation, shoring and backfilling required for the proper installation of work inside the buildings and premises, or outside as may be necessary. Slope sides of excavation to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

B. Excess excavation shall be backfilled with gravel or sand and mechanically compacted to give full support to the piping. In case of sewer lines in rock excavation, the excavation shall be made at least 6" deeper than required and backfilled with sand to outside invert grades to provide cushion. No underground lines shall be covered until the installation has been approved by the Owner's representative, and the Authority Having Jurisdiction. Maintain sides and slopes of excavations in safe condition until completion of backfilling. All backfill shall be thoroughly compacted.

C. No cinders shall be used for backfilling where steel, iron or copper piping is used. All trenches near or under footings shall be cut only after approval of the Owner's representative, and all backfilling of such trenches shall be according to his direction.

D. All items of grading which will in any manner affect the bearing capacity of the soil foundations upon which will be placed floor slabs, walls, column footings or piping beds shall be performed to the satisfaction of the Owner's representative. All soil foundation areas which will in any manner support any of the above stated construction will be compacted by the use of mechanical tampers to at least 95% of the maximum density of the soil foundations, as determined by the compaction control test, in accordance with the "Method of test for Moisture Density Relations of Soils, ASTM Designation D1557." The moisture control at the time of compaction shall be uniform throughout the area and shall not vary more than 5% above or below the optimum moisture content as determined by the above described " Compaction Control Test." Place fill in 8" loose layers, each layer compacted.

E. Division 31, (31 23 16 - Excavation, 31 23 23 Fill, 31 26 16.13 Trenching), shall provide Excavation, Fill and Trenching for the Mechanical Contractor, as needed to complete his work.

3.5 EXCAVATION DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations, and from a flooding project site and/or surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions, outside excavation limits to convey rain water and water removed from excavations to collection points or run off areas. Do not use trench excavation as temporary drainage ditches.

3.6 EXCESS EXCAVATION MATERIAL

A. Dirt and debris from trench excavation shall be disposed of by this contractor, as directed by the Owner's representative.

3.7 PIPING INSTALLATION

A. Lay piping in straight lines with uniform slope, leave no pockets. Care shall be taken to keep all foreign materials out of the piping during installation. Where ground water is present, provide suction pumps to keep trenches free of water, and cap ends of piping exposed to ground water when work is interrupted.

B. All underground piping used for the distribution of HVAC systems located outside the building perimeter shall be buried a minimum of 36" from finish grade to top of piping.

C. Piping and ductwork run above the floor SHALL NOT BE LOCATED OVER ELECTRICAL PANELS OR SWITCHBOARDS, except where located above a structural ceiling, or with drain pans approved by the AHJ. This piping includes, but is not limited to, heating water lines.

D. All piping and ductwork SHALL BE ROUTED AROUND Elevator Equipment Rooms. Piping and ductwork may serve the room, but shall not pass through it. Follow all codes applicable to these areas.

E. Isolation valves: Provide isolation ball or butterfly valves with positive shutoff on all inlets and outlets of all major pieces of equipment to facilitate serving and removal of such equipment without the necessity of draining the associated system. These valves are required even if not shown on the Plans.

3.8 OPENINGS IN PIPING AND DUCTWORK

A. Keep all openings covered tightly with plastic during the work.

3.9 PIPE SLEEVES

A. General: Provide pipe sleeves for piping passing through foundations, walls, floors, partitions, and roof to allow piping to pass freely through.

B. Foundation Walls: Where piping passes through walls below finished grade, but does not enter the building spaces, the sleeves shall be Schedule 40 galvanized steel pipe. Provide a modular seal between the sleeve and the piping.

C. Building Walls (Below Grade) and Floor Slabs: Where piping passes through building walls below grade, and floor slabs on grade or below grade, the sleeves shall extend a minimum of 1" inside the building wall or above the finished floor level, and shall be made watertight and gas tight by the appropriate modular seal. Sleeves shall be Schedule 40 galvanized steel pipe. If the sleeve and modular seal are subject to trapping water on the top side, pack with water resistant foam and caulk with flexible caulking or grout.

D. Building Walls and Floor Slabs (Above Grade) - New Construction: Where piping passes through concrete walls or floors within the building, the sleeves shall be of sufficient strength to withstand the pressure and concrete pouring operation without deforming or rupturing. Sheet Metal Ductwork with end slit and formed into flanges is not acceptable. Sleeves shall extend 1" above the finished floor. Sleeves in walls shall be flush on both sides.

E. Piping Subject to Expansion: Where piping is subject to motion due to expansion, such as hot water heating mains, the sleeve shall be made large enough to allow free motion. Where piping passing through is insulated, the sleeve shall be large enough to permit the covering to pass through.

3.10 WALL/FLOOR PLATES AND ESCUTCHEONS

A. Where piping or ductwork passes through any wall, floor or ceiling, it shall be fitted with chromium-plated steel escutcheons or stainless steel angle/trim rings for ductwork, with suitable set screws or other approved holding device. Where extended sleeves are necessary, the plates shall be of sufficient depth to cover the sleeves.

3.11 CONCRETE INSERTS

A. Inserts shall be installed in forms as work progresses.

B. See structural detail for hangers in pre-cast floor panels system.

3.12 HANGERS AND SUPPORTS

A. General

1. Submittals: The Contractor shall submit, prior to installation, the following information and data for approval.
   a. Data Sheets on all cataloged items to be used.
   b. Sketches covering all specially designed hanger assemblies and fabrications.
2. Where thermal movement will occur, the hanger assembly must be capable of supporting in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger location, in order to prevent excessive stress on piping, ductwork, and/or equipment.
3. Concrete Inserts: Where piping or ductwork is supported from the concrete structure, inserts shall be provided for rod sizes up to 3/4". Where support rod sizes exceeds 3/4" diameter or where load exceeds the recommended load for the inserts, use two inserts with a trapeze-type connecting member below the concrete.
4. Where piping or ductwork is to be supported from building steel, beam clamps shall be used. Beam clamp selection shall be for the required load and the configuration of the steel at the point of attachment. Drilling holes in the steel for hanger rod will not be permitted unless approved by the Structural Engineer. Use only adjustable side beam clamps (Type 25); standard beam clamps are not acceptable.
5. Angle Clips: Where piping or ductwork is to be supported from building wood structure, angle clips shall be used with lag bolts sized to support the load in shear. Any attachment to wooden structural members shall be subject to the approval of the Structural Engineer.
6. Hanger Rods: Hanger rod size shall be selected on the basis of loading from the following table:

3/8"	610#
1/2"	1130#
5/8"	1810#
3/4"	2710#

Hangers shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing. DO NOT BEND RODS.

7. All rods shall be electro-plated to prevent corrosion.
8. All rods shall be double-nutted with lock washer and cut washer, on both ends if applicable, and excess rod on the bottom shall be cut flush and ground for safety.
9. Brackets and Racks: Where piping or ductwork is run adjacent walls or steel columns, welded steel brackets shall be used as base supports. Multiple pipe racks or trapeze hangers shall be designed and fabricated to suit conditions.
10. Vibration Control: Provide a vibration control hanger at the first three hanger locations from any motor operated equipment. Hanger shall consist of steel frame and spring with neoprene washers.
11. Auxiliary Steel: All auxiliary steel necessary for the installation of the hangers and supports shall be designed in accordance with the AISC Steel Handbook, furnished by the Mechanical Contractor, and shall receive one shop coat of primer paint.

B. Hangers for Piping:
1. Riser Clamps (Vertical Piping): Piping shall be supported at each floor with a riser clamp or at sufficient intervals to carry the weight of the piping and that of its contents. Stacks shall be supported at their base by a concrete pier or by a suitable hanger located on the horizontal run, close to the riser. Riser clamp extensions shall rest on the building structure where possible; auxiliary steel supports shall be provided where it is impractical to rest directly on the building structure.
2. Hanger Spacing for Piping: The maximum allowable spacing for pipe hangers shall be in accordance with the following. Where concentrated loads of valves, fittings, etc., occur, closer spacing will be necessary and shall be based on the weight supported and recommended loads for the hanger components.
   a. Copper Tube and Piping - Soldered, Brazed or Welded.
      1) Horizontally: 1-1/2" and smaller, 6'; 2" and larger, 10'.
      2) Vertically - Each floor, not to exceed 10'. See note 1.
   b. Notes For Above:
      1) Vertical water lines may be supported in accordance with recognized engineering principles with regard to expansion and contraction when first approved by the Authority Having Jurisdiction.
3. Hangers - Horizontal Piping:
   a. General: All hangers shall be provided with means of vertical adjustment. The following schedule shall be followed to select acceptable hangers for the type of service.
      1) Non-Insulated Copper Piping:
         a) Copper Tubing Hanger
         b) Copper Tubing Band Hanger
         c) Copper Tubing Clevis Hanger
      2) Insulated Copper Piping:
         a) Adjustable steel Band Hanger with Shield.
         b) Clevis hanger with Shield.

3) Insulated pipe inserts shall be provided at hanger, support, anchor, and guide locations on piping requiring insulation. See paragraph “Inserts at Hangers and Supports” in this Section.

b. Roller Hangers: Provide roller hangers for all applications where thermal movement causes hanger rods to deviate more than 4 degrees from vertical, or longitudinal movement exceeds 1/2". Provide roller hangers used in conjunction with protection saddles to suit the insulation thickness.

c. Trapeze Hangers: Where piping is grouped in parallel, provide manufactured strut or trapeze hangers consisting of two steel angles bolted back-to-back, with space between for a hanger rod at each end. Where the length of angles is greater than 24", there shall be three rod supports. Piping shall be able to move independently, and hanger spacing shall be dictated by the smallest pipe.

d. Anchors, Guides and Sliding Supports: Shall be as shown on the drawings or as necessary to prevent excessive stress in either piping or equipment.

C. Hangers for Ductwork:

1. Reference and comply with SMACNA HVAC Duct Construction Standards - Metal and Flexible Table 4-1 - Rectangular Duct Hangers Minimum Size, and Table 4-2 - Minimum Hanger Sizes for Round Duct for the following:
   a. Strap and Rod Sizes
   b. Hanger Spacing
2. Steel Cables
   a. Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 602
   b. Stainless-Steel ducts: Stainless steel complying with ASTM A 492.
   c. End Connections: Cadmium-plate steel assemblies with brackets, swivel, and bolts designed for duct hanger service, with an automatic locking and clamping device.
3. Duct Attachments: Sheet-metal screws, blind rivets, or self-tapping metal screws, compatible with duct materials.
4. Support materials shall match ductwork materials (i.e. provide stainless steel support materials for stainless steel duct, galvanized steel support materials for galvanized steel ducts, and aluminum support materials for aluminum ducts).
5. Hanger and Support Installation:
   a. Reference Table 4-1 - Rectangular Duct Hangers Minimum Size, and Table 4-2 - Minimum Hanger Sizes for Round Duct.
   b. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheetmetal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
   c. Install upper attachments to structure. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.13 CUTTING AND PATCHING (NEW WORK)

A. Furnish dimensions and locations of openings to other Contractors doing the work. Provide ample time to avoid delays and unnecessary labor. Cutting and patching

made necessary to admit work, repair defective material or workmanship, or by neglect to anticipate proper requirements, shall be done by the General Contractor at the expense of the Mechanical Contractor.

3.14 ACCESSIBILITY

A. Locate valves, damper operators, etc., so as to be easily accessible in mechanical spaces or through access panels, specified hereinafter. Otherwise, obtain Owner's representative's approval of location.

B. Any equipment requiring maintenance clearances for servicing of filters, motors, compressors, etc., shall be carefully coordinated to avoid servicing problems. Failure of contractor to comply with this requirement shall be sufficient cause for contractor to make all necessary changes at no cost to the Owner. To avoid problems with interpretation of the NEC, allow 42" for all electrical clearances.

3.15 ACCESS DOORS AND PANELS

A. Locations of panels shall be carefully selected during construction, so as not to be located behind cabinets, etc. Coordinate closely with the Architectural and Electrical Plans before installing panels.

B. In areas such as janitor's room or on painted walls, etc., access panels shall be prime-coated and painted by the General Contractor; install before surrounding surfaces have been painted. In areas such as toilet rooms, the access panels shall be stainless steel or chrome-plated. In other finished areas such as on ceilings, all access panels shall have the same type of finished surface as that of the surrounding area.

C. Verify with the Owner's representative location and finish prior to ordering; failure to get the Owner's representative's approval may result in replacement of access panels at the Mechanical Contractor's expense. Minimum size of access doors is 12" x 12"; actual size depends on the specific circumstance, and panel shall be large enough to accomplish replacement or repair of the item requiring access. The Owner's representative shall have the final say on whether or not the access is of sufficient size.

D. Provide access panels for all concealed valves for all piping.

E. Doors shall have cylinder lock latches, all keyed alike.

F. Provide fire-rated access doors for one-hour or two-hour rated walls and ceilings; units shall be UL labeled.

3.16 MECHANICAL ACCESSES

A. Provide suitable access to all mechanical equipment requiring servicing, maintenance, replacement, or repair. In concealed spaces where access has not been provided by the Architect by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the Owner's representative, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades, to avoid conflict therewith, and such locations shall be approved by the Owner's representative prior to installation of access panels.

B. In addition to building access openings, provide access panels on ducts where required to service fire dampers, damper operators, and other associated equipment. All access doors providing access to mechanically furnished panels,

control boxes and filter compartments shall be provided with fully-hinged, easily-opened access doors. Minimum size is 12" x 12", unless access area prevents that size. Consult Owner's representative prior to installing smaller sizes.

3.17 PAINTING, TAGS, ETC.

A. Field painting of all mechanical equipment, piping etc., located in and exposed in occupied spaces, shall be by the General Contractor. See Architectural painting specification.

B. Identification Tags: Provide identification tags for each main shutoff and control valve throughout the building indicating the system served. Tags shall be black phenolic plastic with white engraved inscription attached with chrome chain.

C. Mechanical Room: Provide valve tag lists under glass, one for the Boiler Room and one for the remaining areas of the building. Coordinate location with Owner's representative.

D. Each major item of Mechanical Equipment shall be provided with the name of the item, i.e., Exhaust Fan No. 2, etc., in labels of black phenolic plastic with white engraved inscription. Minimum size of lettering is 1" with a maximum of 2". Select appropriate sizes for the size of the equipment being labeled. Align labels with edges of equipment and locate labels so as to be visible. For ceiling exhaust fans, provide additional tag on grille.

E. Pipe Markers:

1. Piping throughout the building shall be equal to Brady Corporation No. B-946, M.S.I. No. MS-900, meeting or exceeding ANSI A13.10-1981. Pipe markers shall consist of two wraps of arrows in the direction of flow, color, and wording as indicated in the schedule following. Stencils shall be visibly located and spaced on maximum 20'-0" centers for long straight pipe runs. Stencils shall be located on both sides of a wall, within the first 3'.
2. Color Code Schedule: (Service, Color, Stencil)

Condensate	Yellow COND
Refrigerant Liquid	Yellow RL
Refrigerant Gas	Yellow RG

3. Ceiling Tile Access Labels: Where it is necessary to remove ceiling tile(s) to access mechanical equipment, backdraft dampers, motorized dampers, remote control sensors, valves/controllers, combination fire/smoke dampers, filters, valves, volume dampers, etc., provide and install round 1/2" diameter, yellow, self-adhesive labels on the metal ceiling grid, visible near all four corners of each tile requiring removal.

3.18 TEMPORARY HEAT

A. HVAC units shall not be used for temporary heat.

3.19 FIRE INTEGRITY

A. All penetrations of fire-rated walls, ceilings, roofs or floors via ductwork, piping and air terminals must be protected by fire dampers, fire/smoke dampers, appropriately-rated assemblies, and caulking to maintain integrity of structure.

3.20 CLEANING UP

A. Comply with requirements of the General Specifications.

B. Ducts shall be maintained as clean as possible during erection, and shall be blown clean before the building painting operations are started. Ducts and apparatus casings shall be thoroughly cleaned before fans and filters are operated. Installed ductwork and equipment openings shall be sealed to prevent contamination of construction dust, debris and moisture. Uninstalled ductwork and equipment shall be securely covered to prevent contamination or the insulation getting wet. Uninstalled ductwork and equipment shall be stored on pallets or dunnage that prevents water reaching the ductwork. If ductwork or equipment is found to be dirty or wet, this contractor shall be responsible for replacing such items. Contaminated or wet duct shall be spray painted with high visibility paint and removed from the site immediately. After equipment has been used for any purpose, such as adjusting, testing, or temporary ventilation, filters shall be replaced and exhaust/return ducts shall be cleaned. Use temporary filters with 80% to 85% filter efficiency during construction. Cover all openings with temporary filters if startup, test and balance, or commissioning starts prior to all work being completed in the building.

C. Remove tags, shipping labels, etc., from all ductwork in exposed areas, whether ductwork is painted or not.

3.21 CAULKING

A. Caulk all openings and flash around all piping, equipment, and ductwork passing through roof, floor, and walls. All caulking shall be water resistant. See also paragraph "Fire Integrity" for rated walls, ceilings, roofs, or floor penetrations.

B. All piping and ductwork penetrations of walls, ceilings, and floors shall be caulked. A chrome-plated steel escutcheon plate shall be installed at each visible piping penetration of walls, ceilings, or floors. All duct penetrations of walls, ceilings or floors shall be flashed with 3" x 3" 18 gauge galvanized sheet metal angle for concealed ducts, and stainless steel angle for exposed ducts.

3.22 OPERATION OF EQUIPMENT AND SYSTEMS

A. Contractor is responsible during all periods of balancing and testing. Provide temporary utilities as required.

3.23 TESTS, ADJUSTMENTS AND INSPECTION

A. Test all work thoroughly and systematically, both during construction and after completion. Notify Owner's representative 48 hours in advance of all tests. Tests shall be maintained until approved. Tests shall be as hereinafter specified.

B. The Contractor shall test the completed installation as in regular service. Any defects or imperfections that may show up are to be promptly corrected. The Contractor shall guarantee the entire system and all parts thereof for a period of one year from date of final acceptance. The Contractor shall repair or replace any part which may show signs of failure during that time, if such failure, in the opinion of the Owner's representative, is due to imperfections in material or to improper workmanship.

C. No system, whether prescribed for testing or not, shall be covered or concealed below ground, in walls, in ceiling spaces, or generally from ease of viewing, without first notifying the Owner's representative. Failure to notify the Owner's representative for inspection of concealed systems shall be cause to require this contractor to uncover and recover such systems at no additional cost to Owner.

D. A log of all tests shall be kept. The log shall note, dates, time of day test started, system or portion of system tested, length of test, test results, and who witnessed the test (AHJ, Owner's representative, or GC). Contractor shall insert legible name of witnesses. Contractor to submit a copy of the contractor's test log monthly to the Owner's representative.

E. Review the project to determine when final inspection is appropriate and advise Owner's representative. Mechanical Contractor is required to complete his work before requesting final inspection.

F. See specification section of piping used for test methods or procedures used.

G. Conduct refrigeration leak test on all DX equipment prior to installation on or in buildings.

3.24 FINAL INSPECTION

A. This contractor shall thoroughly review and inspect the project to determine when final inspection is required, and shall so advise the Owner's representative. It shall be understood that the work is to be essentially complete. If such is not the case and more than one final inspection and one backcheck are necessary, this Contractor may be billed for the additional backchecks at the then governing rate for the personnel involved. The final inspection punchlist shall be legibly signed on a copy of the punch list by a person responsible for the trade involved, and transmitted to the Owner’s representative, before a backcheck will be scheduled.

3.25 PROTECTION AND CLEANING

A. All equipment and material installed by this contractor shall be properly protected from damage during the course of construction.

B. In attic or other spaces where piping such as condensate drains, heating lines, refrigeration lines, etc. have been installed at floor level and interfere with foot traffic, the Mechanical Contractor shall provide covers to protect this piping. Wood or other such material will be acceptable. Where duct plenums or duct runs interfere with normal traffic patterns of maintenance personnel, the sheet metal contractor shall provide a wooden "bridge" over the ducts to prevent damage.

C. Protect walking paths in mechanical spaces. Maintain 6'-8" headroom minimum, for all piping and ductwork. If required clearance is not possible, obtain permission from the Owner's representative to violate the above requirement, and comply with protective measures required.

3.26 SPECIAL PROTECTION

A. Exercise maximum precaution to protect the building and equipment from damage of any kind, and in particular, prevent water and dust seepage into new equipment.

3.27 BALANCING WORK

A. Provide Testing, Adjusting and Balancing as required in this section of the specification.

3.28 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

A. Scope: Following installation of mechanical work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out

locations of servicing points and required points of maintenance to Owner's representatives.

B. General Description of Instruction Periods: Each period shall include preliminary discussion and presentation of information from maintenance manuals with appropriate references to drawings, followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures, temperature control settings, and available adjustments.

C. Scheduling of Instruction Periods: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given to the Owner's representative at least two weeks prior to the instruction periods, and agreement reached as to the date at which the instruction periods are to be performed. Advise Owner's representative two weeks prior to date when ready to conduct instruction and demonstrations; receive approvals of proposed date prior to making final arrangements.

D. Schedule an additional instruction period for the off-season. That is, if initial instruction period takes place during the heating season, schedule another during the cooling season, or vice versa.

3.29 ON-SITE OBSERVATIONS AND SAFETY MEASURES

A. During its progress, all work shall be subject to observation by the Owner's representative, and of the National Board of Fire Underwriters, State and Local Inspectors. The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The Contractor will be totally responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Owner's representative to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. It shall be the Contractor's responsibility to comply with "Safety and Health Regulations for Construction" in the Federal Register by the U.S. Department of Labor. Contractor shall be responsible for providing all such safety measures and shall consult with the State and/or Federal Safety Inspector for interpretation whenever in doubt as to whether he is or is not in compliance with State and/or Federal regulations. Furthermore, the Contractor distinctly assumes all risk or damage or injury to any persons or property wherever located resulting from any action or operation under this contract or in connection with the work.

3.30 DRAFT STOPS

A. It shall be the responsibility of each contractor performing his trade to verify with Architectural Plans and to maintain the integrity of draft stops, whenever his work requires penetration of these areas. Patch as required to maintain integrity of draft stops.

3.31 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing equipment.

B. Prepare a manufacturer's startup report, and turn over to the Owner's representative.

3.32 COMMISSIONING

A. This Contractor will be required to participate in the commissioning process. The Mechanical Contractor shall complete the start-up forms and be available to assist in the commissioning process. The Mechanical Contractor shall include in his bid all cost associated with his portion of the commissioning process.

B. As a minimum, the following Mechanical Items shall be commissioned, see Commissioning section.
   1. All HVAC equipment.
   2. Exhaust fans.
   3. Make-up air units.
   4. Control systems.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers and Arrows.

D. Ductwork Identification Nameplates.

E. Ceiling Tile Access Markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

B. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification, including matching size and colored arrows.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Project Record Documents: Record actual locations of tagged valves, on As-Builts.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation

B. Seton Identification Products

C. Marking Services, Inc.

D. Approved equal

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height, Equipment: 1 -1/2".

3. Background Color: Black.

2.3 VALVE TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Tag Lettering: First Line = System Abbreviation; Second Line = Consecutive Valve Numbers, starting at 01.

C. Beaded Chain: #6 x 4-1/2" - Nickel Plated.

2.4 PIPE MARKERS & ARROWS

A. Color: Conform to ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Plastic Tape Pipe Arrows: Nominal sizes and colors to match pipe markers. 1", 2" and 4".

D. Size of pipe markers:
1. 3/4" to 1-1/4" OSD of Covering = 1/2" letters.
2. 1-1/2" to 2" OSD of Covering = 3/4" letters.
3. 2-1/2" to 6" OSD of Covering = 1-1/4" letters.
4. 8" to 10" OSD of Covering = 2-1/2" letters.
5. Over 10" OSD of Covering = 3-1/2" letters.

2.5 DUCTWORK IDENTIFICATION NAMEPLATES

A. Description:
1. Plastic Laminate 1-1/4" letters and arrows.
2. Vinyl Markers 1-1/4" letters and arrows.
3. Color per ASME standards.

2.6 CEILING TILE ACCESS MARKERS

A. Description: Vinyl or plastic markers, 1/2" diameter minimum with color coded head.

B. Color code as follows:
1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Plumbing Valves: Green.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates and markers with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion.

B. Install tags with nickel plated chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions. Install a circular wrap of arrows at each end of the pipe marker.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify all mechanical equipment with plastic nameplates.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify ALL valves with tags.

H. Tag automatic controls, instruments, valves and relays. Key to control schematic, show on control As-Builts. Provide tags identical to valve tags. First line = abbreviation [EMCS]. Number consecutively starting at 01.

I. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20' on center for straight runs, including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

J. Identify all ductwork with plastic or vinyl nameplates. Identify with air handling unit identification number, system (Outside Air, Return Air, Exhaust Air, Supply Air, etc.) and area served. Locate identification as ducts leave or return to Air Handling Unit, on duct runs not to exceed 20' on center, adjacent each branch, at each side of penetration of structure or enclosure, and at each obstruction. air handling unit, at each side of penetration of structure or enclosure, and at each obstruction. Do not install labels on exposed ductwork.

K. Provide ceiling tile access markers to locate Mechanical Equipment, Filters, Dampers, etc., above T-bar type panel ceilings. Locate on the metal ceiling grid near all four corners of the tile requiring removal.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Testing, adjusting, and balance of domestic water.

D. Commissioning activities.

1.2 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 23 08 00 - Commissioning of HVAC.

1.3 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.

B. ASHRAE Standard 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

E. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Qualifications: Submit name of Testing, Adjusting and Balancing agency and TAB supervisor within 30 days after award of the Mechanical Contract by the General Contractor. Include a list of the last 12 projects completed with a list of the respective Owner's representatives and a contact phone number for each.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit for Review.
   2. Submit for forwarding to Owner’s Commissioning Authority.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, system capacity, and efficiency measurements to be performed and a description of specific test procedures, parameters, and formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
c. Identification and types of measurement instruments to be used and their most recent calibration date.
d. Discussion of what notations and markings will be made on the ductwork and piping drawings during the process.
e. Final test report forms to be used.
f. Detailed step-by-step procedures for TAB work for each system and issue, including:
    1) Terminal flow calibration (for each terminal type).
    2) Diffuser proportioning.
    3) Branch/sub-main proportioning.
    4) Total flow calculations.
    5) Rechecking.
    6) Diversity issues.
g. Details of how TOTAL flow will be determined; for example:
    1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
    2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
h. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
k. Method of checking building static and exhaust fan and/or relief damper capacity.
l. Methods for making coil or other system plant capacity measurements, if specified.
m. Time schedule for TAB work to be done in phases (by floor, etc.).
n. Time schedule for deferred or seasonal TAB work, if specified.
o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
p. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
q. Procedures for formal progress reports, including scope and frequency.
r. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

D. Progress Reports. Provide preliminary/hand-written balance report no later than one (1) week after completion of work.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner's representative and for inclusion in Operating and Maintenance manuals.
   2. Provide reports complete with index page and indexing bookmarks. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   3. Include actual instrument list with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Use report format recommended by TAB standard. If none of these apply, follow ASHRAE Standard 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.
   6. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name of project.
      e. Project location of project.
      f. Project Architect.
      g. Project Mechanical Engineer.
      h. Project General Contractor.
      i. Project Mechanical Contractor.
      j. Project Controls Contractor.
      k. Commissioning Agent.
      l. Report date.

F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.5 DALT DUCT AIR LEAKAGE TESTING - ASSISTANCE

A. M.C. to provide HVAC equipment mechanics to operate and assist with HVAC equipment and HVAC ductwork mechanics to provide the field required test ports and other modifications needed to perform the DALT. M.C. to ensure that these support personnel are present at the agreed upon times.

1.6 INSULATION PRIOR TO TAB OR DALT AIR LEAKAGE TESTING

A. Do not allow insulating of ductwork or piping prior to TAB and or DALT testing. If project is behind schedule, the Owner's representative may agree to partial insulation prior to completion of testing, if the TAB contractor agrees.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. M.C. to provide conformed construction drawings and specifications to the TAB firm, if available. If not available, issue the same drawings that are being provided to the other Subcontractors, along with any RFIs or Change Orders that

may affect their work. The M.C. is responsible to keep the TAB firm up to date with pertinent contract documents and correspondence.

C. M.C. to provide approved equipment submittals and project schedule for the use by the TAB subcontractor.

1.8 WARRANTY

A. Include a warranty for 24 months after final acceptance by the Owner, during which time the Owner may request a recheck, or resetting of any outlet, coil or device listed in the project test report. TAB contractor to contact other project subcontractors if their technical assistance is required to make any test or adjustments required. Maximum number of rechecks shall not exceed a yearly total of 5% of the entire project. However, if the balance reports are proved to be inaccurate, the Owner may request the entire project be re-balanced during the warranty period. See paragraph Commissioning in this Section for recheck and failure criteria. The above warranty shall be included in the original contract bid proposal.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Standard 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

D. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

E. TAB Team Members: Submit their qualifications along with the Companies qualifications and the TAB Supervisor qualifications. TAB team approved to accomplish work on this contract, must be full-time employees of the TAB agency. No other personnel are allowed to do TAB work on this contract.

F. Pre-Qualified TAB Agencies:

1. Neudorfer Engineering (206) 621-1810.
2. Hardin & Sons (253) 952-0467.
3. Air Balance Associates (206) 528-4788.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, have HVAC contractor replace or install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Confirm duct system leakage is minimized. Have HVAC contractor coat or recoat joints that may not be up to SMACNA standards prior to testing.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions, or that a letter allowing revised conditions has been received by the TAB contractor.

D. The TAB contractor shall exercise care while performing his work so as to avoid damaging the work of other trades, particularly paint and ceiling tile. If damage is incurred by the Test and Balance Contractor, repairs shall be made at their expense.

3.3 PREPARATION

A. Hold Pre-balancing meeting two weeks prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced, plus General Contractor, Owner’s representative, and Commissioning Agent.
   2. Complete Project Examination noted above prior to Pre-balancing meeting, so that any problems found that would prevent balancing can be dealt with at the meeting.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner’s representative and Commissioning Agent to facilitate spot checks during testing.

C. Request HVAC contractor provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10% of design for supply, return, and exhaust systems.

B. Air Outlets and Inlets: Adjust total airflow to within plus or minus 10% of design to space. Adjust outlets and inlets in space to within plus or minus 10% of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark locations where traverse and other critical measurements were taken on the Plans and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order; replace belt guards, close access doors, close doors to electrical switch boxes, and restore thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner's representative and Owner's Commissioning Agent.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure performance capacity tests for all coils, confirm manufacturers capacities, single points test are acceptable for units below 7.5 tons, for units above 7.5 ton, average of multiple readings in compliance with acceptable standards, is required.

K. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

L. Where modulating dampers are provided, take measurements and balance at extreme conditions.

M. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05” positive static pressure near in the hallways.

N. At completion, be sure all test holes in low pressure duct have pressure sealing plugs installed; duct tape is not allowed. Test holes in high pressure duct shall employ threaded and capped duct air fittings.

O. The Test and Balance contractor shall include in his bid the cost of one sheave change for each belt driven air moving piece of equipment. If a sheave change is not required, the test and balance contractor shall submit to the Owner a credit for the work that was not required. The total cost of sheave changes shall be listed as a separate line item on the Schedule of Values and submitted to the Owner’s representative for approval prior to the first pay application.

3.7 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities. Test systems at design fluid temperatures.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance.

C. Adjust water systems to provide required or design quantities.

D. Adjust domestic water balancing valves and set aquastat setpoint, verify operation of aquastat and supply/return water temperatures on hot water recirculation systems.

3.8 COMMISSIONING

A. See Section 23 08 00 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Provide DALT (Duct air leakage testing)

D. Provide refrigeration piping leakage testing.

E. Provide Air barrier testing.

F. Re-check final TAB report data as directed by the Owner's Commissioning Agent.
   1. Original TAB agency shall execute the re-checks.
   2. Use the same test instruments as used in the original TAB work.
   3. Failure of more than 10% of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.

G. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods and established control setpoints. Physically verify that

at least one leg, from fan to diffuser, during full cooling, has all balancing dampers for terminal units taking off downstream of the static pressure sensor wide open, with the damper for the terminal unit on the critical leg 90% or more open.

H. No seasonal tests are required.

3.9 MINIMUM DATA TO BE REPORTED

A. Pumps:
1. Identification/number
2. Manufacturer
3. Size/model
4. Impeller
5. Service
6. Design flow rate, pressure drop, BHP
7. Actual flow rate, pressure drop, BHP
8. Discharge pressure
9. Suction pressure
10. Total operating head pressure
11. Shut-off, discharge and suction pressures
12. Shut-off, total head pressure

B. Air Cooled Condensers:
1. Identification/number
2. Location
3. Manufacturer
4. Model number
5. Serial number
6. Entering DB air temperature, design and actual
7. Leaving DB air temperature, design and actual
8. Number of compressors

C. Heat Exchangers:
1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Model number
6. Serial number
7. Entering/leaving temperature for outside air
8. Entering/leaving temperature for exhaust air
9. Heat exchanger pressure drop

D. Cooling Coils (for both heating and cooling modes):
1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Entering air DB temperature, design and actual
7. Entering air WB temperature, design and actual
8. Leaving air DB temperature, design and actual
9. Leaving air WB temperature, design and actual

10. Water flow, design and actual
11. Water pressure drop, design and actual
12. Saturated suction temperature, design and actual
13. Air pressure drop, design and actual

E. Electric Duct Heaters:
1. Manufacturer
2. Identification/number
3. Location
4. Model number
5. Design kW
6. Number of stages
7. Phase, voltage, amperage
8. Test voltage (each phase)
9. Test amperage (each phase)
10. Air flow, specified and actual
11. Temperature rise, specified and actual

F. Air Moving Equipment:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Show filter static pressure, specified and actual
11. Inlet pressure
12. Discharge pressure
13. Sheave Make/Size/Bore
14. Number of Belts/Make/Size
15. Fan RPM

G. Exhaust Fans:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Fan RPM

H. Duct Traverses:
1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity

7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

I. Duct Leak Tests:
1. Description of ductwork under test
2. Duct design operating pressure
3. Duct design test static pressure
4. Duct capacity, air flow
5. Maximum allowable leakage duct capacity times leak factor
6. Test apparatus
   a. Blower
   b. Orifice, tube size
   c. Orifice size
   d. Calibrated
7. Test static pressure
8. Test orifice differential pressure
9. Leakage

J. Terminal Unit Data: (Residential Heat Pump units)
1. Manufacturer
2. Identification/number
3. Location
4. Model number
5. Size
6. Minimum design air flow
7. Maximum actual air flow
8. Entering/leaving temperature for outside air for heat exchanger
9. Entering/leaving temperature for exhaust air for heat exchanger
10. Heat exchanger pressure drop
11. Entering/leaving temperature for air across the coil.

K. Air Distribution Tests:
1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass Fiber Flexible Duct Wrap Insulation

B. Duct Liner

C. Plenum Waterproofing

D. Laminated Flexible Elastomeric Cellular Insulation for Exterior Use

1.2 RELATED REQUIREMENTS

A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

B. Section 23 31 00 - HVAC Ductwork and Casings:

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

J. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.

L. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on-site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Do not store excess material in the building. Provide secure dry storage on-site, to store material.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION INSTALLED INSIDE BUILDINGS

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 MANUFACTURERS

A. Knauf Fiber Glass

B. Johns Manville Corporation

C. Owens Corning Corp

D. CertainTeed Corporation

E. Pittsburgh Corning Corporation

F. Armacell International

G. Approved equal.

2.3 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0% by weight.

B. Usage: HVAC Air Distribution Systems Ductwork - Interior - Medium to Low Temperatures.

C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16 gage.

2.4 DUCT LINER

A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board with impregnated surface and edges coated with polyvinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.
1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficients:
a. 1" Thickness: 0.45.

B. Usage: Line Duct as detailed in paragraphs below.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, welded with press-on head, per SMACNA standards.

2.5 PLENUM WATERPROOFING

A. Coordinate installation of a continuous self-adhering rubberized asphalt flashing, extend up each side a minimum of 6" and extend from the weatherproof louver back 4' or to the end of the plenum and up 6"; corners to be sealed watertight. Mechanical Contractor to provide certification letter stating Plenum Waterproofing has been installed in all plenums; provide a copy to the Owner's Commissioning Agent and Owner's representative.

2.6 LAMINATED FLEXIBLE ELASTOMERIC CLOSED-CELL INSULATION FOR EXTERIOR USE

A. Manufacturer:
1. Armacell International (Armaflex) Armatuff
2. Approved equal

B. Closed-cell insulation with 12 mil embossed laminate surface with self-adhesive backing, UV-resistant.

2.7 JACKETS

A. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
1. Thickness: 0.016".
2. Finish: Smooth.

3. Fittings: 0.010" thick die shaped fitting covers with factory attached protective liner.
4. Metal Jacket Bands: 3/8" wide; 0.010: thick stainless steel.

B. Prefabricated Flexible Self-adhering Membrane
1. Manufacturers/Product:
   a. MFM Building Products; Flexclad
   b. Polyguard; Alumaguard
   c. Venturetape; VentureClad
   d. Approved equal.
2. Composed of aluminum composite foil, polymer film, and rubberized asphalt adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ductwork pressurization has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards; have a copy on site for reference. Employ only skilled tradesmen specializing in this kind of work.

C. Insulated ductwork conveying air, below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ductwork conveying air above ambient temperature:
1. Provide with standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ductwork Exposed in finished Spaces: Finish with stainless steel jacket.

F. Exterior Duct Insulation Applications: Provide laminated closed-cell insulation. Locate seams so as to prevent water infiltration.
1. Secure insulation with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct Liner Application:
1. Adhere insulation with adhesive for 90% coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Provide thickness of insulation to meet or exceed Washington State Energy Code and or local codes whichever are more stringent.

B. Special Requirements - DUCT LINER.
1. Duct liner for this project will be 1" unless noted otherwise in Contract documents.
2. Contractor to show extent of duct lining on shop drawings to avoid confusion, omission and possible rejection.
3. Line ALL of the following ductwork (see exceptions in #4 below);
a. Transfer air ductwork
b. Supply and return ductwork within 10’ of an air handling/fan coil unit
4. Fiberglass liner shall not be used in the following applications:
a. Do not line fume hood or kitchen hood ductwork.
b. Within 6' of outside air intakes or outside grilles. (Duct wrap shall be used in these locations).
c. In systems conveying solids, particulates or corrosive gases.
d. In air duct systems exposed to weather that are not sealed and protected against water incursion.
e. Plenums exposed to the outside air, including intake, relief or exhaust plenums.
f. In contact with any HVAC equipment wet surface.
5. Additional requirements may be shown on the plans and are in addition to the requirements specified herein.

C. Special Requirements - DUCT WRAP.
1. Wrap all of the following ductwork:
a. Outside air ductwork within 6' of an outside air intake.
b. Concealed supply, return, and outside air ductwork and plenums, except within 10' of the floor in Mechanical spaces. (Use blanket insulation wrap.)
c. Ductwork that is located on the exterior of the building: Wrap with laminated flexible elastomeric cellular insulation.
d. Plenums.
e. Outside air and relief/exhaust air ductwork from damper to building opening, louver, or hood. Insulation R-value is to match building envelope insulation R-value regardless of location, per the requirements of the Washington State Energy Code.
f. Blanket insulation for primary air ductwork (supply duct between AHU and terminal units), regardless of location.
2. Duct wrap shall not be used in the following applications:

a. In conditioned spaces, do not wrap ductwork exposed to view within a zone that serves that zone.

D. Provide insulation thicknesses per Washington State Energy Code as a minimum.

END OF SECTION

SECTION 23 08 00

MECHANICAL COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the Mechanical Contractor's responsibilities, and that of his subcontractors, for commissioning; each subcontractor or installer is responsible for the installation of a particular system or equipment item to be commissioned, and is responsible for the commissioning activities relating to that system or equipment item.

B. The contractor shall provide the Commissioning agent/authority. The Commissioning agent shall be a Certified CX professional. This Agent shall act as an independent reviewer and shall also be known as Owner’s Commissioning agent (where called out elsewhere in the specification manual)

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use. This specification intent is to make the Mechanical Contracting Team aware of their responsibilities under the Commissioning requirements for this project. This specification should be considered the minimum requirements.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
   1. Control system.
   2. Major and minor equipment items.
   3. Piping systems and equipment, including plumbing systems.
   4. Ductwork and accessories.
   5. Terminal units.
   6. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
   7. Indoor Air Quality Procedures: The CA will coordinate and Contractor will execute; see Section 01 57 21.
   8. All items as specified in the ESDS (Evergreen Sustainable Development Standards)

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.2 RELATED REQUIREMENTS

A. Section 23 09 23.1 - Direct-Digital Control System for HVAC.

B. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

C. Section 23 09 93 - Sequence of Operations for HVAC Controls.

D. Section 23 05 93 - Testing, Adjusting, and Balancing.

1.3 REFERENCE STANDARDS

A. ASHRAE Guideline 1 - The HVAC Commissioning Process; 1996

1.4 SUBMITTALS

A. HVAC Control System Documentation: Submit detailed sequences of operation, control system drawings, and points list, as specified in Section 23 09 93.
   1. Incorporate the sequence of operation information specified in other HVAC specification sections.
   2. Incorporate the shop drawing submittal information specified in the HVAC control system section.
   3. Submittals prepared for other sections may be used in preparation of this documentation.

B. Updated Submittals: Keep the CA informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

C. DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled.

D. System name.

E. List of devices.

F. Step-by-step procedures for testing each controller after installation, including:
   1. Process of verifying proper hardware and wiring installation.
   2. Process of downloading programs to local controllers and verifying that they are addressed correctly.
   3. Process of performing operational checks of each controlled component.
   4. Plan and process for calibrating valve and damper actuators and all sensors.
   5. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
   6. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
   7. Description of the instrumentation required for testing.
   8. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.

G. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of CA.

H. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
   1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide

an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.

2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
   a. Floor.
   b. Room number.
   c. Room name.
   d. Air handler unit ID.
   e. Reference drawing number.
   f. Air terminal unit tag ID.
   g. Heating and/or cooling valve tag ID.
   h. Minimum air flow rate.
   i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

I. Project Record Documents: See Section 01 78 00 for additional requirements.
   1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
   2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and airflow stations on project record drawings.

J. Draft Training Plan: In addition to requirements specified in Section 01 79 00, include:
   1. Follow the recommendations of ASHRAE Guideline 1.
   2. Control system manufacturer's recommended training.

3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

K. Training Manuals: See Section 01 79 00 for additional requirements.
1. Provide three extra copies of the controls training manuals, to be included in the O & M manuals.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup, initial checkout, and required functional performance testing. Unless noted otherwise, such testing equipment will not become the property of the Owner.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cooperate with the Commissioning Authority (CA) to develop the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the CA.

C. Prepare a preliminary schedule for HVAC and domestic water piping, duct systems testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the CA; update the schedule as it changes.

D. Notify the CA when piping and duct systems testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur. Inform the CA when commissioning activities not yet performed or not yet scheduled will delay construction. Notify ahead of time, and be proactive in seeing that the CA has the scheduling information needed to efficiently execute the commissioning process.

E. Put all equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with the contract documents.
1. Provide a pressure/temperature plug at each water sensor that is an input point to the control system.

3.2 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the CA for each item of equipment or other assembly to be commissioned.

C. Valve/Damper Stroke Setup and Check:
   1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
   2. Set pump/fan to normal operating mode.
   3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
   4. Command valve/damper open; verify position is full open and adjust output signal as required.
   5. Command valve/damper to a few intermediate positions.
   6. If actual valve/damper position does not reasonably correspond, replace actuator.

D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

E. Monitor and record Air Barrier Testing

F. Monitor and record DALT (duct air leakage testing)

G. Monitor and record refrigeration piping leakage testing

H. Monitor and record domestic water piping leakage testing

3.3 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use. This includes handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the CA prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.4 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start functional testing until all controlled components have themselves been successfully functionally tested in accordance with the contract documents.

C. Using a skilled technician who is familiar with this building, execute the functional testing of the control system as required by the CA.

D. Functional testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
   1. The scope of trend logging is partially specified; trend log up to 50% more points than specified at no extra cost to Owner.
   2. Perform all trend logging specified in Prefunctional Checklists and Functional Test Procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the CA during testing of controlled equipment; coordinate with commissioning of equipment.
   1. Setpoint changing features and functions.
   2. Sensor calibrations.

G. Demonstrate to the CA:
   1. That all specified functions and features are set up, debugged and fully operable.
   2. All control sequence of operations function as designed.
   3. That scheduling features are fully functional and set up, including holidays.
   4. That all graphic screens and value readouts are completed.
   5. Correct date and time setting in central computer.
   6. That field panels read the same time as the central computer; sample 10% of field panels; if any of those fail, sample another 10%; if any of those fail, test all remaining units at no extra cost to Owner.
   7. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad. Demonstrate 100% of panels and 10% of ports; if any ports fail, sample another 10%; if any of those fail, test all remaining units at no extra cost to Owner.
   8. Power failure and battery backup and power-up restart functions.
   9. Global commands features.
   10. Security and access codes.
   11. Occupant over-rides (manual, telephone, key, keypad, etc.).
   12. Operation and maintenance schedules and alarms.
   13. Occupancy sensors and controls.
   14. Communications to remote sites.
   15. All control strategies and sequences not tested during controlled equipment testing.
   16. Trend logging and graphing features that are specified.
   17. Other integrated tests specified in the contract documents
   18. That control system features that are included but not specified to be set up are actually installed.

H. Perform and submit trend logging on the following using the control system, for minimum period of five (5) days including one weekend, if the control points are monitored by the control system:
   1. Duty cycling, if specified.

2. Demand limiting, including over-ride of limiting.
3. Sequential staging ON of equipment; optionally demonstrate manually.
4. Optimum start-stop functions.
5. Miscellaneous equipment current or status for duty cycling and demand limiting.
6. Equipment optimum start/stop functions.

I. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.5 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 and 23 00 10 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to CA for review; make changes recommended by CA.

D. CA will add commissioning records to manuals after submission to Owner.

3.6 DEMONSTRATION AND TRAINING

A. See Section 23 00 10 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner's personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the CA during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the minimum durations of training, as called for in the individual equipment specifications.

E. TAB Review: Instruct Owner's personnel for minimum four (4) hours, after completion of TAB, on the following:
1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of 4 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
   a. This training may be held on-site or at the manufacturer's facility.
   b. If held off site, the training may occur prior to final completion of the system installation.
2. Phase 2 - Integrating with HVAC Systems: Provide minimum of eight (8) hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
   a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
   b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
   c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
   d. Every display screen, allowing time for questions.
   e. Use of keypad or plug-in laptop computer at the zone level.
   f. Use of remote access to the system via phone lines or networks.
   g. Setting up and changing an air terminal unit controller.
   h. Graphics generation.
   i. Point database entry and modifications.
3. Phase 3 - Post-Occupancy: Six (6) months after occupancy conduct minimum of eight (8) hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer’s representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 09 13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General Requirements for Field Devices
B. Air Differential Pressure Switch
C. Automatic Control Dampers (Motorized Dampers)
D. Automatic Control Damper - Actuators
E. Control Panel
F. Current Switch/Sensor
G. Differential Pressure Transducer
H. Duct Smoke Detector
I. Guards, General
J. Input / Output Sensors
K. Liquid Immersion Temperature Sensor
L. Switches - Electric
M. Temperature Sensors
N. Thermostats
O. Transmitters

1.2 RELATED REQUIREMENTS

A. Section 23 33 00 - Air Duct Accessories: Installation of automatic dampers.
B. Section 23 09 23 - Direct-Digital Control System for HVAC.
C. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.3 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods for Testing Dampers for Rating; Air Movement and Control Association International, Inc..
B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; National Electrical Manufacturers Association.
C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association.
E. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module used on this particular project..

B. Manufacturer's Instructions: Provide for all manufactured components.

C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 WARRANTY

A. Provide a two (2) year manufacturer’s warranty on equipment, covering parts and labor.

PART 2 - PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

B. The following field devices may or may not be used on this project. See Section 23 09 23.1 Direct Digital Control System for HVAC and 23 09 93 HVAC Sequence of Operation for specific field devices required. The following alphabetical listing of field devices is provided to establish a quality and operating range for commonly used devices.

C. Actuators, controllers, etc. shall utilize 24-volt DC power unless otherwise noted. Power to equipment requiring line voltage connection shall be coordinated with the E.C.
1. Combination fire/smoke dampers, smoke dampers, etc., that are not connected to the Building Automation System shall be line voltage.

D. Thermostats:
1. Where thermostats are located on exterior walls, provide insulating pad behind thermostat.

2.2 AIR STATIC PRESSURE

A. Sensing Probe: Provide full width duct traverse, extruded aluminum probe, with multiple sensing ports.
1. Air Monitor Model STAT-probe/1.

B. Outside Air Static Pressure Sensing Probe: Shall consist of 2 circular, parallel, 10 gage anodized aluminum plates with a 2.00" FPT connection. Sensor shall be accurate to within 2% of actual ambient pressure when subject to radial wind velocities up to 80 miles per hour with approach angles up to 30 degrees to horizontal.
1. Air Monitor model S.O.A.P, or approved equal.

C. Sensor: Solid state, 24vac input that shall vary output voltage with charges in sense static pressure. Sensor shall have an end to end accuracy of +/- 1% of span or better, including non-linearity and hysteresis.
   1. Setra or approved equal.

2.3 AUTOMATIC CONTROL DAMPERS (MOTORIZED DAMPERS)

A. Manufacturers
   1. Ruskin
   2. Greenheck
   3. Vent Products
   4. Air Balance
   5. Johnson Control
   6. Honeywell
   7. Approved equal.

B. General:
   1. Performance: Test in accordance with AMCA 500-D.
   2. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage.
   3. Blades: Galvanized steel, maximum blade size 6" wide, 48" long, minimum 22 gauge, attached to minimum 1/2" shafts with set screws.
   4. Blade Seals: Synthetic elastomeric mechanically attached, field replaceable. Suitable for 0 degrees F to 180 degrees F operating temperature.
   5. Jamb Seals: Spring stainless steel.
   6. Shaft Bearings: Oil impregnated sintered bronze.
   7. Linkage Bearings: Oil impregnated sintered bronze.
   8. Blade linkages shall be attached at mid-point of blade length.
   9. Leakage: Less than 1% based on approach velocity of 2000 ft/min and 4” wg.
   10. Maximum Pressure Differential: 6" wg.
   11. Temperature Limits: -40 to 200 degrees F.
   12. Provide actuators as required for application.
   13. Provide one actuator for every 20 sq. ft. of damper.
   14. Actuators shall utilize spring return on all outside air applications.
   15. Actuators shall be manufactured by Belimo.

C. Low Leakage Modulating Type
   1. Opposed-blade type unless indicated otherwise.
   2. Internally braced frames shall be constructed of 16-gage galvanized steel.
   3. Airfoil blades shall be equipped with 0.50" minimum thickness axles, stainless steel or bronze sleeve bearings, field-replaceable EDPM or vinyl edge seals, and a flexible aluminum or stainless steel compression type jamb seal.
   4. Leakage shall not be greater than 4 cfm/square foot at 1.0” static pressure difference.
   5. Damper shall have a maximum operating static pressure differential of 6.00" and be capable of operating with face velocities up to 3,000 fpm.
   6. Unless indicated otherwise, dampers shall be sized for a maximum pressure drop of 0.10" at maximum design airflow.
   7. Ruskin CD50 or approved equal.

D. Low Leakage Two-Position type
1. Parallel blade type with construction and performance same as specified for low leakage modulating type.
2. Airfoil blades shall be equipped with 0.50" minimum thickness axles, stainless steel or bronze sleeve bearings, field-replaceable EDPM or vinyl edge seals, and a flexible aluminum or stainless steel compression type jamb seal.
3. Leakage shall not be greater than 4 cfm/square foot at 1.0” static pressure difference.
4. Damper shall have a maximum operating static pressure differential of 6.00" and be capable of operating with face velocities up to 3,000 fpm.
5. Unless otherwise indicated, dampers shall be same size as duct; where dampers are not installed in a duct, dampers shall be sized for a maximum pressure drop of 0.05" at maximum design airflow.
6. Ruskin CD50 or approved equal.

2.4 AUTOMATIC CONTROL DAMPER - ACTUATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20% greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two-position control and for fail safe operation.
1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
2. Provide one operator for maximum 20 square foot damper section.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.
2. Electric control actuation shall utilize direct coupled actuators.
3. Damper actuators shall be Brushless DC Motor Technology with stall protection, bidirectional, fail-safe spring return (where shown on Plans or in sequence of operation as normally open or normally closed), all metal housing, manual override, and independent adjustable dual auxiliary switch.
4. The actuator assembly shall include the necessary hardware and proper mounting and connection to a standard 1/2" diameter shaft or damper blade.
5. Actuators shall be designed for mounting directly to the damper shaft without the need for connecting linkages.
6. Actuators having more than 100 lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed "v" shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with damper shaft.
7. All actuators having more than a 100 lb-in torque output shall accept a 1" diameter shaft directly, without the need for auxiliary adapters.
8. All actuators shall be designed and manufactured using ISO900 registered procedures, and shall be listed under Standards UL873 and CSA22.2 No. 24-93 I.

2.5 CONTROL PANEL

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face. Label panel and other devices.

B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.6 CURRENT SWITCH/SENSOR

A. Solid state relay which senses AC current and outputs a DC current suitable for either a DDC digital input or analog input, as required for application. Veris, Hawkeye or approved equal.

2.7 DUCT SMOKE DETECTOR

A. Furnished, controlled, and wired per the Fire Alarm Systems specification by the Electrical Contractor. Provide monitoring through EMCS, low voltage wiring and contactors provided by the Control Contractor.

2.8 GUARDS, GENERAL

A. Heavy-duty plastic-coated metal type with secure backing plate, removable with a Phillips screw driver.

B. Polycarbonate vented lockable guard for thermostats.

C. Provide where shown on drawings or as required in the Sequence of Operation.

2.9 INPUT/OUTPUT SENSORS

A. Static Pressure Sensors:
   1. Unidirectional with ranges not exceeding 150% of maximum expected input.
   2. Temperature compensated with typical thermal error or 0.06% of full scale in temperature range of 40 to 100 degrees F.
   3. Accuracy: 1% of full scale with repeatability 0.3%.
   4. Output: 0 - 5 vdc with power at 12 to 28 vdc.

B. Equipment Operation Sensors:
   1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5" wg.
   2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.
   3. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175% of rated motor current.

2.10 LIQUID FLOW SWITCH

A. Paddle type, 150 psig maximum working pressure, and flow actuation sensitivity as required for application. Johnson Control - Penn F61 series, or approved equal.

2.11 LIQUID IMMERSION TEMPERATURE SENSOR

A. Temperature monitoring range: 20 degrees F TO 120 degrees F for cooling applications, and 70 degrees F TO 220 degrees F heating application.

B. Output Signal: 4-20 ma DC.

C. Calibration Adjustments: 0 and span (field adjustable).

D. Accuracy at Calibration point: +/- 0.5 degree F.

E. RTD Material: Platinum 100 ohm.

2.12 SWITCHES - ELECTRIC

A. Door
1. Switch for installation in door jamb (concealed) with pushbutton, so that opening door causes switch action.

B. Multipurpose - Control Panel
1. Allen-Bradley 800H, or approved equal.

C. Wall, On/Off
1. Standard wall box type switch, single pole, with illuminated switch to indicate that controlled item is on. Provide with stainless steel wall plate, labeled as to function. Leviton or approved equal.

D. Wall, Three-Position
1. Standard wall box-type switch, with center “OFF” position, pole and throw to suit application. Provide with stainless steel wall plate labeled as to function and each switch position. Arrow-Hart 4356, 4357, 4361, 4371 or approved equal.

2.13 TEMPERATURE SENSORS

A. All temperature sensors shall be solid state electronic, factory-calibrated to within 0.5 degree F, interchangeable with housing appropriate for application.

B. Wall sensors to be installed as indicated on drawings. Mount 48" above finished floor.

C. Duct sensors to be installed such that the sensing element is in the main air stream.

D. Immersion sensors to be installed in wells. Immersion wells shall be filled with thermal compound before installation of immersion sensors.

E. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake, and in a location that is in the shade most of the day. Provide element with sun shade to minimize solar effects. Mount sun shade at least 3” from building outside wall. Sun shade shall not inhibit the flow of ambient air across the sensing element. Shade shall also protect sensing element from snow, ice and rain.

F. Duct (single point) temperature:
1. Temperature monitoring range: / -20 to 120 degrees F.
2. Output signal / Changing resistance.
3. Accuracy at Calibration point: +/-0.5 degrees F.

G. Duct Averaging temperature:
1. Temperature monitoring range: -20 to 120 degrees F.
2. Output signal: 4 - 20 ma DC.

3. Accuracy at Calibration point: 0 .05 degrees F.
4. Sensor probe length: 25' L.

H. Outside air temperature:
1. Temperature monitoring range: -40 to 120 degrees F.
2. Output signal: 4 - 20 ma DC
3. Accuracy at calibration point: +/- 0.5 degrees F.

2.14 THERMOSTATS

A. Line-Voltage Thermostats:
1. Integral manual On/Off/Auto selector switch, single or two pole as required.
2. Dead band: Maximum 2 degrees F.
3. Cover: Locking with set point adjustment, with thermometer.
4. Rating: Motor load.

B. Room Thermostat Accessories:
1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Thermostat Guards: Locking transparent plastic mounted on separate base.
4. Adjusting Key: As required for device.
5. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

C. Outdoor Reset Thermostat:
1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
2. Scale range: -10 to 70 degrees F.

D. Immersion Thermostat:
1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

E. Airstream Thermostats:
1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
2. Averaging service remote bulb element: 7.5 feet.

2.15 TRANSMITTERS

A. Building Static Pressure Transmitter:
1. One-pipe, direct-acting, double-bell, scale range 0.01" to 6.0" wg positive or negative, and sensitivity of 0.0005" wg. Transmit electronic signal to receiver with matching scale range.

B. Pressure Transmitters:
1. One-pipe direct-acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.

C. Temperature Transmitters:
1. One-pipe, directly proportional output signal to measured variable, linearity within +/- 0.5% of range for 200 degree F span and +/- 1% for 50 degree F span, with 50 degrees F temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as, but not limited to, air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as, but not limited to, air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48" above floor. Align with lighting switches and humidistats.

C. Provide guards on thermostats in entrances, public areas, and where indicated.

D. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

E. Mount control panels adjacent associated equipment on vibration free walls or free-standing unistrut supports. A single cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

F. Install "HAND/OFF/AUTO" selector switches to override automatic interlock controls when switch is in "HAND" position.

G. Provide electrical material, conduit, electrical wiring, and installation in accordance with the Divisions 26, 27, and 28.

H. Provide insulating pad behind thermostat if thermostats are located on exterior walls.

END OF SECTION

SECTION 23 09 23.1

DIGITAL CONTROLS - VRF SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. System Description
B. Operator Interface
C. Controllers
D. Power Supplies and Line Filtering
E. System Software
F. Controller Software

1.2 RELATED REQUIREMENTS

A. 23 09 13 - Instrumentation and Control Devices for HVAC
B. 23 09 93 - Sequences of Operation for HVAC Controls

1.3 SCOPE

A. Provide a City Multi control system to monitor and control Variable Refrigerant Flow and all other equipment provided in the commercial/common areas in this contract. All areas other than the living units shall receive DDC controls. Reference sequence of operations for more information.

1.4 SECTION INCLUDES

A. Control equipment, a fully integrated Building Automation System, incorporating Direct Digital Control (DDC) for energy management, equipment monitoring, and control, and subsystems with native BACnet open communications capabilities, as here in specified.
B. Software, material and equipment shall be standard components, regularly manufactured for this and /or other systems and not custom or proprietary designed specifically for this project.
C. The BAS contractor shall be responsible for all BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with all local and national codes.
D. Provide all fire alarm detection and shutdown devices required for HVAC equipment. Provide all required wire and conduit up to fire alarm control panel, unless otherwise specified or shown. This requirement is job specific, Control Contractor to investigate and review fire alarm specification for interface requirements and include the necessary cost in his bid.
E. The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®

F. The CITY MULTI Controls Network (CMCN) consists of remote controllers, schedule timers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, error email distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces.

G. All low voltage wiring is the responsibility of the Mechanical Contractor. Provide all wiring for VRF system, residential heat pumps, etc.

1.5 RELATED REQUIREMENTS

A. Section 23 81 29 - Variable Refrigerant Flow (VRF) HVAC System

B. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.6 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.7 WARRANTY

A. VRF units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.

B. The systems are designed by a certified CITY MULTI Diamond Designer, and shall be installed by a certified CITY MULTI Diamond Dealer, AND verified with a completed commissioning report submitted to Mitsubishi Electric Service Department, then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.

C. In addition the compressor shall have a manufacturer's limited warranty for a period of six (6) years from date of installation.

D. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

E. This warranty does not include labor.

1.8 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of twenty-five years of HVAC experience in the U.S. market.

B. The CITY MULTI VRF system shall be installed by a Mitsubishi authorized CITY MULTI Diamond Dealer with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

1.9 SUBMITTALS

A. Product Data: Provide data for each system component and software module. Provide names and pertinent information on any sub tier subcontractors you plan to hire.

B. Shop Drawings:

1. Submit 5 complete sets of documentation within 31 days after the notice to proceed date. Provide System schematic drawings within 90 days after the notice to proceed date.
2. Provide 11" x 17" drawings or larger.
3. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
4. List connected data points, including connected control unit and input device.
5. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
6. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
7. Indicate description and sequence of operation of operating, user, and application software.
8. Reference Plans for system piping/wiring diagram.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
1. Revise shop drawings to reflect actual installation and operating sequences.

E. Operation and Maintenance Data:
1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.10 SYSTEM DESCRIPTION

A. The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

B. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

C. System controls and control components shall be installed in accordance with the manufacturer’s written installation instructions.

D. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

E. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.

F. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.

G. System shall be capable of email generation for remote alarm annunciation.

H. Control system start-up is a required service which is to be completed by the manufacturer or a duly-authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

I. Provide all wiring as needed.

PART 2 - PRODUCTS

2.1 CMCN - CITY MULTI CONTROLS NETWORK

A. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces.

B. Electrical Characteristics

1. The CMCN operates at 30VDC. Controller power and communications shall be via a common non-polar communications bus.
2. Wiring:
   a. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
   b. Control wiring for the Smart ME remote controller shall be from the remote controller to the first associated indoor unit (TB-5) M-NET connection. The Smart ME remote controller shall be assigned an M-NET address.
   c. Control wiring for the Simple MA and Wireless MA remote controllers shall be from the remote controller (receiver) to the first associated indoor unit then to the remaining associated indoor units in a daisy-chain configuration.
   d. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
   e. The AE-200, AE-50, and EW-50A centralized controller shall be capable of being networked with other AE-200, AE-50, and EW-50A centralized controllers for centralized control.
3. Wiring type:

a. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
b. Network wiring shall be CAT-5 with RJ-45 connection.

2.2 REMOTE CONTROLLERS

A. Smart ME Remote Controller (PAR-U01MEDU)
1. Capable of controlling up to 16 indoor units (defined as 1 group).
2. Approximately 5.5” x 5” in size and white in color with an auto-timeout touch screen LCD display.
3. Shall support a selection from multiple languages (English, Spanish or French) for display information.
4. Shall support temperature display selection of Fahrenheit or Celsius.
5. Shall control the following grouped operations: On/Off, Operation Mode (cool, heat, auto*, dry, fan and setback* (*R2/WR2-Series Simultaneous Heating and Cooling only)), temperature set point, fan speed setting, and airflow direction setting.
6. Shall support timer settings of on/off/temperature up to 8 times in a day in 5-minute increments.
7. Shall support an Auto Off timer.
8. Shall be complete with occupancy sensor.
9. Shall be able to limit the set temperature range from the Smart ME Remote Controller, or via the central controller.
10. Room temperature shall be sensed at either the Smart ME Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting.
11. The ME Remote Controller shall only be used in same group with other ME Remote Controllers with a maximum of two ME Remote Controllers per group.
12. The ME Remote Controller shall require manual addressing using rotary dial switch to the M-NET communication bus. The ME Remote Controller shall connect using two-wire, stranded, non-polar control wire to TB5 connection terminal on the indoor unit.

B. Ventilation Controller (PZ-62DR-EA)
1. Controllers shall control all lossnay units and inlet/discharge heaters on the project.
2. Approximately 5.” x 5” in size and white in color with an auto-timeout touch screen LCD display.
3. Shall support a selection from multiple languages (English, Spanish or French) for display information.
4. Shall support temperature display selection of Fahrenheit or Celsius.
5. Shall support an Auto Off timer.
6. Shall be complete with occupancy sensor.
7. Shall be complete with nighttime purge
8. Shall be connected to the central system.

2.3 INPUT/OUTPUT (IO) BOARDS

A. Advanced HVAC Controller (AHC)
1. The AHC shall be capable of providing programmable binary and analog inputs and outputs to control general equipment in conjunction with indoor unit functions and states.

2. Input and output states and values shall be monitored through the EW-50A or the Smart ME Remote controller.
3. The Smart ME remote controller shall be able to adjust temperature and humidity set points for equipment controlled by the AHC.
4. In addition to analog and binary inputs the AHC can monitor M-NET equipment states and sensor values.
5. Available inputs include room temperature, room humidity, occupancy, brightness, outdoor temperature, inlet/outlet water temperature (PWFY), on/off state, mode, ventilation on/off, error status.
6. In addition to programmable analog and binary outputs, the AHC can control indoor unit on/off, mode, temperature set point, fan speed, LOSSNAY on/off and LOSSNAY fan speed.
7. Sequence of Operation shall be specified bythe end user and programmed by MEUS Controls Engineer.

B. Digital Input Digital Output (DIDO) Board
1. The DIDO board shall be capable of providing On/Off control for non-Mitsubishi equipment via the AE-200/AE-50/ EW-50A Centralized Controller's licensed web browser functions, the touch screen of the AE-200, AE-50, and TC-24 Centralized Controller, the interlock function of the AE-200/AE-50/ EW-50A and the TG-2000 software.
2. Each DIDO board shall have two digital inputs and two digital outputs. Each digital output shall be capable of supporting an independent schedule via the AE-200/AE-50/ EW-50A Centralized Controller's web browser functions and the TG-2000 software. Status indication of the On/Off state of the non-Mitsubishi equipment shall be either via the On/Off status of the digital output or by receipt of a digital input to the DIDO board.
3. The DIDO board shall be capable of receiving a digital input for interlock settings with the CITY MULTI indoor units or digital outputs on the DIDO board. Based on the digital input status the DIDO board shall be capable of setting the following parameter on the indoor unit On/Off, Mode, and Set Temperature to predefined settings. The DIDO board shall also be capable of interlocking the On/Off state of a digital output on the DIDO board based on an onboard channel digital input status or a free contact input status from system indoor units.

C. Analog Input (AI) Board
1. The AI board shall be capable of monitoring temperature or humidity via the AE-200/AE-50/ EW-50A Centralized Controller's web browser functions and the TG-2000 software.
2. Each AI board shall have two analog inputs. Each input shall be capable of receiving a 4/20mA, 0/10 VDC, or 1/5 VDC signal for monitoring temperature or humidity.
3. The AI board shall be capable of monitoring the temperature or humidity input and shall be capable of displaying graphical trending of the temperature or humidity values via the AE-200/AE-50/ EW-50A Centralized Controller's web browser functions and the TG-2000 software.
4. Notification of user adjustable high and low level alarms shall be capable of being emailed to distribution list or outputted via a digital output.
5. The AI board shall be capable of setting the following parameters on the indoor unit On/Off, Mode, and Set Temperature to predefined settings

based on the input value of the temperature or humidity. The AI board shall also be capable of interlocking the On/Off state of a digital output on the input value of the temperature or humidity.

2.4 CENTRALIZED CONTROLLERS

A. AE-200 Centralized Controller

1. The AE-200A Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple CITY MULTI outdoor units with the use of three (3) AE-50A expansion controllers.
2. The AE-200A Centralized Controller shall be approximately 11-5/32” x 7-55/64” x 2-17/32” in size and shall be powered with an integrated 100-240 VAC power supply.
3. The AE-200A Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring.
4. Provide licensing fee and enable for all BACnet points to be connected to the building central DDC system.
5. When being used alone without the expansion controllers, the AE-200A Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the AE-200 Centralized Controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting.
6. Since the AE-200A provides centralized control, it shall be able to enable or disable operation of local remote controllers.
7. In terms of scheduling, the AE-200A Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.
8. All AE-200A Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three AE-50A expansion controllers for display of up to two hundred (200) indoor units on the main AE-200A interface.
9. The AE-200A Centralized Controller shall be capable of performing initial settings via the high-resolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.
10. Standard software functions shall be available so that the building manager can securely log into each AE-200A via the PC’s web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available but are not included. The Tenant Billing function shall require TG-2000 Integrated System software in conjunction with the Centralized Controllers.

AE-200 (Centralized Controller)			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit. Auto mode is available for the R2/WR2-Series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *1. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group

AE-200 (Centralized Controller)			
Item	**Description**	**Operation**	**Display**
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group. Space temperature displayed on the indoor unit icon on the touch screen interface.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *3. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Outdoor Unit Status	Compressor capacity percentage and system pressure (high and low) pressure (excludes S-Series)	Each ODU	Each ODU
Connected Unit Information	ET addresses of all connected systems	Each IDU, ODU and BC	Each IDU, ODU and BC
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between “Hi”, “Low” and “Stop”. When setting a group of only free plan LOSSNAY units, you can switch between “Normal ventilation”, “Interchange ventilation” and “Automatic ventilation”.	Each Group	Each Group
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese are available.	N/A	Collective

AE-200 (Centralized Controller)			
Item	**Description**	**Operation**	**Display**
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" Requires the external I/O cables (PAC-YG10HA-E) sold separately.	*5 Collective	*5 Collective

B. Provide the following software functions per AE-200:
   1. Personal Web Browser: The CMCN shall be capable of allowing up to 50 individual users to monitor and control user defined zones via a network PC or MAC's web browser.

2.5 SYSTEM INTEGRATION

A. CMCN: System Integration: The CMCN shall be capable of supporting integration with Building Management Systems (BMS).

B. BAC-HD150: BACnet® Interface:
   1. The Mitsubishi Electric Cooling & Heating BACnet® interface, BAC-HD150, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories.
   2. Shall support BACnet Broadcast Management (BBMD).
   3. Shall support a maximum of 50 indoor units.
   4. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.
   5. BACnet control points shall be as follows.

BACnet™ Object ID = Object Type + Instance Number
BACnet™ Instance Numbers

XX XX XX

1st two digits: 01-50, 99 identifies the BAC-HD150 (most often "01")

2nd two digits: 01-50, 99 identifies the group#

Final two digits: 01 – 99 identifies the control point

Control item	Object type	Instance number	Unit Inactive Text-1	Active Text-2	Text-3	Text-4	Text-5	Notes
On Off Setup	BO	xxxx01	Stop	Run				
On Off State	BI	xxxx02	Stop	Run				
Alarm Signal	BI	xxxx03	Normal	Error				
Error Code	MI	xxxx04	Normal	01: Normal 02: Other errors 03: Refrigeration system fault 04: Water system error 05: Air system error		06: Electronic system error 07: Sensor fault 08: Communication error 09: System error		
Operational Mode Setup	MO	xxxx05	Cooling	Heating	Fan	Auto	Dry	
Operational Mode State	MI	xxxx06	Cooling	Heating	Fan		Dry	
Fan Speed Setup	MO	xxxx07	Low	High	Mid 2	Mid 1		
Fan Speed State	MI	xxxx08	Low	High	Mid 2	Mid 1		
Room Temp [Water Temp]	AI	xxxx09	°F/°C					
Set Temp [Set Water Temp]	AV	xxxx10	°F/°C					
Filter Sign [Circulating Water Exchange Sign]	BI	xxxx11	OFF	ON				
Filter Sign Reset [Circulating Water Exchange Sign Reset]	BV	xxxx12	Reset	Void				
Prohibition On Off	BV	xxxx13	Permit	Prohibit				
Prohibition Mode	BV	xxxx14	Permit	Prohibit				
Prohibition Filter Sign Reset [Prohibition Circulating Water Exchange Sign Reset]	BV	xxxx15	Permit	Prohibit				
Prohibition Set Temperature	BV	xxxx16	Permit	Prohibit				
M-NET Communication State	BI	xxxx20	Normal	Error				
System Forced Off	BV	xxxx21 999921	Reset	Execute				
Air Direction Setup	MO	xxxx22	Horizontal	Downblow 60%	Downblow 80%	Downblow 100%	Swing	
Air Direction State	MI	xxxx23	Horizontal	Downblow 60%	Downblow 80%	Downblow 100%	Swing	
Ventilation Mode Setup	MO	xxxx35	Heat exchange	Bypass	Auto			
Ventilation Mode State	MI	xxxx36	Heat exchange	Bypass	Auto			
Air To Water Mode Setup	MO	xxxx37	Heating	Heating ECO	Hot Water	Antifreeze	Cooling	
Air To Water Mode State	MI	xxxx38	Heating	Heating ECO	Hot Water	Antifreeze	Cooling	
Expansion Controller Communication State	BI	xx9981	Normal	Error				

Figure 1. BACnet Points List

2.6 POWER SUPPLY

A. Power Supply (PAC-SC51KUA)

B. The power supply shall supply 24VDC (TB3) for the AE-200 centralized controller and 30VDC (TB2) voltage for the central control transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, and wiring, is installed prior to installation proceeding.

3.2 INSTALLATION

A. Third Party Controls: Installing contractor shall coordinate and provide all BAS/BMS control requirements, equipment and connections for the complete building.

B. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

C. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to Sequence of Operation. Refer to Section 23 09 93.

D. Provide power and communications to each programmable control unit.

E. Provide conduit and electrical wiring in accordance with Division 26. Electrical material and installation shall be in accordance with appropriate requirements of the Electrical Division.

F. Identify equipment, boxes, panels, etc. with permanently mounted phenolic engraved labels.

3.3 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning as described in Section 23 08 00 prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representatives in operation of systems plant and equipment for 24-hours of training, dates and times to be selected by the Owner.

3.4 TEMPERATURE CONTROL SYSTEM ADJUSTMENT

A. After entire heating and ventilating system is operational, the Control Contractor shall calibrate all sensing and readout devices not pre-calibrated at the factory and shall observe the operation of each and every item of equipment and shall submit a report that all items furnished under this contract are functioning according to the intent of the above specifications. The report shall be signed by the individual directly responsible for the supervision of the installation of the Temperature Control System.

B. In addition this Contractor shall schedule and coordinate with the HVAC system Balancer to have a field technician on-site to place all systems in operation as required and to perform necessary adjustments to facilitate the complete balancing of all HVAC systems. The field technician shall be required to be on-

site until the entire system is balanced, or provide the Balancer with access to the control system, the Balancer may require the technician be present anyway, if the system fails to operate properly. Scheduling of the foregoing shall be at a time mutually acceptable to the HVAC System Balancing Contractor and the Control Contractor as approved by the Owner's representative.

C. In addition to above, the Control Contractor will provide a qualified technician to operate and adjust the system while the Owner's Commissioning Agent observes the sequence of operation and the operation of each piece of equipment.

D. Unless stated otherwise, adjust as follows; Control Temperatures within plus and minus two (2) degrees F, Humidity within plus or minus 3% of the set point and Static Pressure within 10% of set point.

3.5 DEMONSTRATION AND INSTRUCTIONS

A. As part of the Owner's training, demonstrate complete and operating systems to the Owner's maintenance personnel.

3.6 COMPLETION

A. Start the Control System Design immediately upon award of the General Contract.

B. Notify the Owner's representative if a Subcontract has not been provided to the Control Subcontractor within 4 weeks of award of the General Contract.

C. Complete the controls system in a timely manner. Allow time for Balancing and Commissioning to take place prior to substantial completion.

D. Notify the Owner's representative if the General Contractors Schedule does not allow time to complete the Control work, Balancing, or Commissioning.

E. The Control Contractor has a performance contract and as such is required to complete his work, to allow Balancing and Commissioning to be completed prior to Substantial Completion. Should job conditions delay the project and not allow enough time for the Control Contractor to complete his work, notify the Owner's representative immediately upon first instance of schedule creep, request additional time from the General Contractor to offset these delays. Continue to notify the Owner's representative and the General Contractor if the schedule does not improve. The Control Contractor is responsible to be done per the original time line, any delays will need to be established as caused by others and not by the Control Contractor. Future specifications and contracts depend on the Control Contractor performing as contracted on this project.

3.7 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

3.8 COMMISSIONING

A. See Section 23 08 00 for commissioning requirements.

END OF SECTION

SECTION 23 09 93

SEQUENCES OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
1. Alarm Reporting
2. Dedicated Outside Air System (DOAS)
3. Duct Heaters
4. Duct Smoke Detectors
5. Elevator Machine Rooms
6. Exhaust Fan - General Instructions
7. Fire Alarm Monitoring and Air Handling Equipment Shutdown
8. Heat Pump – Hallway Makeup air units
9. Heat Pumps – VRF Units
10. Motorized Dampers on Outside Air Ducts
11. Night Setback
12. Occupied Mode
13. Optimum Start/Stop
14. Start-Up of Mechanical Equipment
15. Unit Heaters
16. Unoccupied Mode
17. Warm-Up Mode - Mechanical Equipment
18. Water Heaters - Domestic Water
19. Water Meters – Alternate Bid

1.2 RELATED SECTIONS

A. Section 23 09 23.1 - Direct-Digital Control System for HVAC.

B. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

1.3 SUBMITTALS

A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
1. Preface: One or two paragraph overview narrative of the system describing its purpose, components, and function.
2. State each sequence in small segments, and give each segment a unique number for referencing in Functional Test procedures. Provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
3. Include at least the following sequences:
   a. Start-up.

b. Warm-up mode.
c. Occupied mode.
d. Unoccupied mode.
e. Shutdown.
f. Capacity control sequences and equipment staging.
g. Temperature and pressure control, such as setbacks, setups, resets, etc.
h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
i. Effects of power or equipment failure with all standby component functions.
j. Sequences for all alarms and emergency shut downs.
k. Seasonal operational differences and recommendations.
l. Interactions and interlocks with other systems.

4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system.

B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
1. Label with settings, adjustable range of control and limits.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include all monitoring, control and virtual points specified elsewhere.
6. Include a key to all abbreviations.

C. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Provide 5-degree adjustable deadband to meet requirements of Washington State Energy Code.

3.2 ALARM REPORTING

A. Report alarm conditions indicated on the Input/Output Summary to the Operator Station.

3.3 DEDICATED OUTDOOR AIR SYSTEM (DOAS)

A. The air handling unit shall be controlled by the EMCS for all modes of operation, functions, and controls. The safeties and shall be controlled with resident control logic and shall be capable of operating in standalone mode if DDC trunk communication is lost. All safeties shall be monitored by the EMCS.

B. Startup/Shutdown: The equipment shall be started and stopped based on an occupied and unoccupied schedule. This schedule and routine shall be capable of easy modification by any user. Upon fan shutdown, the outside damper shall close, exhaust air damper shall close, and return air damper shall be open.

C. Units shall operate during occupied mode.

D. Morning Warm-up cycle: AHU shall remain inactive.

E. Inlet duct heater shall operate to maintain 20F inlet temperature.

F. Discharge duct heater shall stage to maintain space LAT setpoint.

G. Morning Cool-Down Cycle: The air handling equipment morning cool down mode shall start based on the optimum start time, but only if the previous recent historic log recorded afternoon outdoor temperatures above 75 degrees F. During morning cool-down, the outside, return and exhaust air dampers shall be allowed to operate normally and economizer cooling shall be energized.

H. Night time Purge Cycle: During Night time Purge the zone cooling setpoint will be reduced to equal the zone heating setpoint. At 2:00 AM (adjustable) if the zone is scheduled to be occupied on this day, the zone will enter “Night Purge” mode. Economizers will modulate and fans will cycle and to meet the temperature Setpoint until Occupied mode begins. Heating is locked out. Occupied mode will run as normal to meet the temperature setpoint. Fans run continuously.

3.4 DUCT SMOKE DETECTORS

A. Controlled by fire alarm systems and wired by Electrical Contractor. Provide monitoring through EMCS. Low voltage wiring and contactors for monitoring shall be provided by Controls Contractor.

3.5 ECONOMIZER COOLING (ROOFTOP HEAT PUMPS)

A. Economizer Enthalpy Control

1. The economizer shall be enabled whenever:
   a. The outside air dry-bulb temperature is less than the return air dry-bulb temperature
   b. AND the fan status is on.
2. When the outside air dew point is less than the return air dew point by an adjustable dead band (3 degrees F), the outdoor air damper(s) shall be set for 100% outdoor air.
3. When the Outdoor Air temperature is less than the supply air temperature set point the outdoor air damper, exhaust air damper, and return air damper will modulate, as appropriate, between the adjustable minimum position and full open to maintain the Discharge Air Temperature that will meet the room thermostat demand.
4. When the return air dew point is greater than the outdoor air dew point OR the outdoor air temperature is greater than the return air temperature the exhaust air damper, return air damper and outside air damper shall be positioned to the minimum outside air position.
5. The economizer shall close to 0% (outside air and exhaust dampers shall be closed and return air damper shall be open) whenever:
   a. Supply fan or return fan is off
   b. OR mixed air temperature is less than 40°F.
   c. OR on loss of fan status.
   d. OR the Discharge Air Temperature Sensor has failed
   e. OR the AHU is in the Morning Warm-up or Cool-down mode
6. The Outdoor Air Damper shall be set to its adjustable minimum position if the Economizer function is disabled.
7. Alarms shall be provided as follows:
   a. High Mixed Air Temp: If the mixed air temperature is 5°F greater than set point.
   b. Low Mixed Air Temp: If the mixed air temperature is 5°F less than set point.
   c. High or low supply air temperature

3.6 ELEVATOR MACHINE ROOM

A. Ductless split system heat pump shall maintain machine room temperature at temperature range required by elevator machinery manufacturer.

B. Unit shall run continuously; i.e. not shall not shut down for unoccupied mode.

3.7 ELEVATOR SUMP PUMPS

A. Pumps shall operate based on their own internal control system.

B. Pumps shall monitor oil and pump only water.

C. DDC system to monitor pump status/alarm through BACnet interface in pump control panel.

3.8 EXHAUST FAN - GENERAL INSTRUCTIONS

A. Provide control for each fan as scheduled on the drawings.

B. ALL exhaust fans provided on this project shall be interlocked with the EMCS, except for fans in the living units.

C. Fans not listed to be interlocked or controlled via thermostat or switch shall be controlled directly from the EMCS (schedule shall be adjustable). Refer to Schedule on Plans for additional control requirements.

D. Corresponding motorized dampers on OSA and EA shall open/close when fan is commanded on/off.

3.9 EXHAUST FANS – RESIDENTIAL UNITS

A. Fan shall operate based on wall switch

B. Fan shall operate automatically based on built in humidity sensor

3.10 HEAT PUMPS - TERMINAL UNITS (LIVING UNITS)

A. Each heat pump terminal unit shall be directly controlled by a compatible dedicated stand-alone controller. Controller shall communicate with space sensor in its specific controlled zone. The controller shall directly control heat pump fans, compressor and reversing valves and strip heater as required to maintain zone temperature setpoints. Temperature setpoints shall be adjusted at operator's terminal. Individual heat pump out-of-normal conditions available at the controller shall be displayed as alarms at the operator's terminal.

B. Heating/Cooling: Heat pump controller logic shall cycle compressor and reversing valve to maintain heating and cooling setpoints.

C. Strip heater: Strip heater shall be enabled to provide additional heat when needed when outside air conditions are less than 40F. Strip heater shall also be enabled during defrost.

D. Ventilation: Unit shall provide ventilation through the ERV 24/7

3.11 MAKE UP HEAT PUMP UNITS (HALLWAYS)

A. Each unit shall have a packaged controller.

B. Unit shall operate continuously.

C. Night time/Day time signal shall be received from the central control system optimal start program. The after-hours time duration and zone set points shall be set at the computer terminal.

D. Unit shall monitor space temperature on each floor and utilize averaging to determine the need for heating/cooling.

E. Operation: When unit is enabled, the supply fan shall be enabled, the outside air dampers remain at minimum, return air damper open, and heating system shall modulate to maintain warm-up discharge air setpoint until the occupied start time. Upon reaching the occupied start time, each coil shall maintain room setpoint temperature. The unit shall be placed into cooling mode or heating mode, whichever is required to maintain room set point. Upon being placed in the economizer mode, the unit shall modulate the outside air dampers toward the open position or remain at minimum if the outside air temperature is above 70 degrees F (adjustable).

1. Stage 1 Cooling: Cooling shall be the economizer cycle with the outside air damper fully open and the heating system off.
2. Stage 2 Cooling: Supply fan shall operate, condensing unit shall operate, and the heating system shall remain off. Provide integrated operation so

that the outside air damper can be modulated open when outside air temperature will benefit mechanical cooling.

3. Stage 3 Cooling: Supply fan shall operate, outdoor condensing unit shall operate, and the heating system shall remain off. When outside air temperature does not benefit mechanical cooling, position the outside air damper to the minimum position.
4. Stage 1 Heating: Supply fan shall operate, heat pump unit shall operate, and outside air damper shall be at minimum.
5. Stage 2 Heating: Supply fan shall operate, heat pump unit shall operate, electric strip heater shall operate (over 40F OSA air temperature or during defrost) and outside air damper shall be at minimum.

F. Night Mode: During the night mode system shall operate same as day mode with the exception of a night setback temperature.

G. Provide alarms for compressor failure, emergency heat, etc.

H. Space pressure modulation: Unit shall be modulate outside air damper/relief air damper as needed to provide makeup air to compensate for dryer usage. Modulation shall be based on pressure sensors located on each floor.

3.12 FIRE ALARM MONITORING

A. Monitor fire alarm system for alarm and trouble conditions such that either of these conditions will be communicated to the EMCS host computer equipment.

B. Upon signal from the fire alarm panel, stop all air-handling units, fan coil units, and exhaust fans through software.

3.13 HEAT PUMPS – VRF UNITS

A. Units shall operate with VRF manufacture provided control system.

B. Each heat pump terminal unit shall be directly controlled by a compatible dedicated stand-alone unitary direct digital controller. Controller shall communicate with space sensor in its specific controlled zone. Temperature setpoints shall be adjusted at operator's terminal. Individual heat pump out-of-normal conditions available at the controller shall be displayed as alarms at the operator's terminal. Alarms shall be generated by the system global controller.

C. Unit shall cycle and adjust LEV when needed to maintain occupied or unoccupied mode setpoint.

D. Provide "Condensate Out Of Normal Condition" for each heat pump when condensate pan fills to unacceptable levels. Display condition at operator’s terminal. Shut down entire heat pump. Operator shall have option to set either for each individual zone.

3.14 MOTORIZED DAMPERS ON OUTSIDE AIR DUCTS

A. Motorized dampers shall be provided on the outside air ducts (see Plans for locations). Dampers shall open when air handing units being served by that outside air source are energized and in an occupied or economizer mode.

3.15 NIGHT SETBACK

A. Apply to each heating and ventilation zone.

B. Night Setback shall be configured and interlocked with the building schedule.

C. Night Setback temperature shall be adjustable.

D. Building schedule shall be fully configurable allowing for each day and hour per year.

3.16 OCCUPIED MODE

A. Cooling and heating equipment are enabled as suitable for ambient conditions.

B. DOAS to operate continuously.

C. Shut down fans on receipt of fire alarm condition.

3.17 OPTIMUM START/STOP

A. Apply the Optimized Start/Stop program to each heating and ventilation zone.

B. Optimized Start/Stop shall be fully configurable; provide all required hardware, sensors and programming to enable Optimum Start/Stop.

C. Optimized Start/Stop shall automatically adjust start time for each individual unit to achieve setpoint temperature 30 minutes prior to occupancy.

D. Building schedule shall be fully configurable allowing for each day and hour per year.

3.18 OUTSIDE AIR DUCT DAMPERS

A. Motorized dampers on the outside air ducts (see Plans for locations) shall open when air handing units being served by that outside air source are energized and in an occupied or economizer cooling mode.

3.19 START-UP OF MECHANICAL EQUIPMENT

A. All mechanical equipment shall energize in a staged fashion. In case of loss of electricity due to power failure, holiday/weekend scheduling and morning warm-up shall require mechanical equipment to be staged "on" in a staggered fashion to prevent a large initial electrical load.

3.20 UTILITY CONSUMPTION

A. Monitor and totalize building electrical consumption (KWH). Monitor KW demand and amperage using current transducers. Place current transducers on at Main Distribution Panel(s).

B. Monitor all end use energy meters provided by the electrical contractor. End use meters shall be shall be monitored individually as well as totalized (by end use type), data shall be logged and retrievable for any hour, day, month, or year. Data shall be saved for a minimum of 36 months.

3.21 WALL HEATERS

A. Maintain constant space temperature by cycling unit fan motor and energizing electric heating elements. Integral thermostat continues fan operation until element temperature falls below 100 degrees F (adjustable).

B. Restroom wall heaters shall operate at a fixed setpoint and then shall ramp up to a higher setpoint on a timer. Upon completion of the timer, the setpoint shall revert back.

3.22 UNOCCUPIED CYCLE

A. Supply, return, and exhaust fans shall be de-energized.

B. Outside air and relief air dampers shall be closed.

C. Heating system shall be off.

D. Cooling system shall be off.

E. If a zone requires heating to maintain the minimum night setback temperature, the appropriate equipment, fans, pumps, etc. shall be energized. The cooling system shall remain off. The heating system shall bring the zone up to the night setback minimum temperature.

F. If a zone requires cooling to maintain the maximum night setback temperature, the appropriate equipment shall be energized.

G. Revert to temporary Occupied Mode when space temperature sensor night override button is pushed; override initially set at 2 hours (adjustable).

3.23 WARM-UP MODE - MECHANICAL EQUIPMENT

A. Control system optimum-start controls shall provide warm-up switching for all items indicated as having a warm-up cycle. The outside air dampers shall remain fully closed during the warm-up cycle until the space temperature heating setpoint is reached or occupied period begins, whichever occurs first. After warm-up and 30 minutes prior to room occupancy, the outside air damper shall be opened to minimum outside air volume damper position as listed on Plans and as set by the Test and Balance subcontractor.

3.24 WATER HEATERS, COMMERCIAL AREAS DOMESTIC WATER SYSTEM

A. Water heater shall remain in continuous operation (24/7) in order to avoid allowing growth of Legionella. 140 degrees storage temperature is preferred.

B. Occupied Mode: Water heater is enabled. Start hot water circulator before occupancy, initially set at 30 minutes (adjustable). Provide aquastat to sense return water temperature and cycle the pump.

C. Unoccupied Mode: Water heater is enabled and pump is off.

3.25 WATER METERS - DOMESTIC HOT AND COLD WATER (Alternate Bid)

A. Hot and Cold water meters shall be monitored for each living unit.

B. Provide monthly totalized summary on a per unit basis.

C. Provide yearly totalized summary for building reference.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping
B. Refrigerant
C. Valves
D. Flexible Connections
E. Insulation
F. Jackets

1.2 RELATED REQUIREMENTS

A. Section 23 00 20 - Basic Materials and Methods; Inserts

1.3 REFERENCE STANDARDS

A. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; Air-Conditioning, Heating, and Refrigeration Institute.
B. ASHRAE Standard 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; (ANSI/ASHRAE Standard 15).
C. ASHRAE Standard 34 - Designation and Safety Classification of Refrigerants; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
E. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes; The American Society of Mechanical Engineers.
F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers.
G. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
H. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
I. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
J. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; and errata.
K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
L. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

M. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

N. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes

O. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical

P. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SYSTEM DESCRIPTION

A. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.

B. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.5 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

B. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Test Reports: Indicate results of leak test, acid test.

D. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

E. Submit certifications of compliance with ASME (BPV IX) for each welder.

F. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures shall conform to ASME (BPV IX) and applicable state labor regulations.

C. Provide Welder Certification in accordance with ASME (BPV IX).

D. Products Requiring Electrical Connection shall be listed and classified by UL as suitable for the purpose indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers; seal prior to shipment and keep sealed until connected into system.

PART 2 - PRODUCTS

2.1 PIPING

A. Copper Tube: ASTM B 280, H58 hard drawn cleaned, dehydrated and sealed marked ACR on hard tempered straight tubing.
1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy, with between 5% & 15% silver.

B. Condensate
1. Copper Tube: ASTM B 88, Type L (B), drawn.
2. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
3. Joints: ASTM B 32, Lead Free Solder.

C. Mitsubishi VRF System
1. Standard ACR fittings rated for use with R410A are to be used for all connections. Proprietary manufacturer-specific appurtenances are not allowed.
2. Refrigerant pipe for CITY MULTI shall be made of phosphorus deoxidized copper, and has two types.
a. ACR Type-L “Annealed Temper”: Soft copper pipe, can be easily bent with human hand.
b. ACR Type L “Drawn Temper”: Hard copper pipe (straight pipe).
3. The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi] . The refrigerant piping should ensure the safety under the maximum operation pressure. Refer to recommend piping specifications in Mitsubishi Electric’s engineering manual. Pipes of radical thickness 0.7mm or less shall not be used.
4. Insulation: Refrigerant lines, as well as any valves, shall be insulated end to end with closed-cell pipe insulation, thickness as required by the Washington State Energy Code or local jurisdiction, whichever is more stringent.

D. Pipe Supports and Anchors:
1. Conform to ASME B31.5.
2. Hangers for Pipe Sizes 1/2" to 1-1/2": Malleable iron adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2" and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3": Cast iron hook.

6. Wall Support for Pipe Sizes 4" and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded. Zinc plated.

2.2 REFRIGERANT

A. Refrigerant: 410a, combination of difluoromethane (HFC-32) and pentafluoroethane (HFC-125) as defined in ASHRAE Standard 34. Verify with equipment manufacturer prior to charging.

B. Other refrigerants are not to be used unless prior approval is obtained from the Owner’s representative.

2.3 VALVES

A. Manufacturers:
1. Sporlan Valve Company
2. Approved equal

B. Ball Valves:
1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals. Maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

2.4 FLEXIBLE CONNECTORS

A. Manufacturers:
1. Circuit Hydraulics, Ltd.
2. Flexicraft Industries
3. Penflex
4. Reflock
5. Approved equal

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9" long with copper tube ends; for maximum working pressure of 500 psi.

C. Double braided stainless steel flexible pipe connections with Reflock end connections.

2.5 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 3; use molded tubular material wherever possible.
1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

B. Usage: Refrigeration Piping - Interior / Exterior.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

D. Interior pipe installations: No finish is required over concealed insulation indoors. Apply two coats of manufacturer's recommended finish, where insulation is exposed indoors.

E. Inserts: Provide inserts at all support locations; see Section 23 00 20.

F. Exterior pipe installations:
   1. Apply one coat of manufacturer's recommended finish
   2. Jacket
      a. Stainless steel jacket and fittings; make watertight.
      b. Zinc-coated sheetmetal ducting. SlimDuct RD-series or approved equal.
      c. UV-, fire-, and weather-resistant ivory-colored extruded PVC round duct; SlimDuct PD-Series or approved equal.

2.6 JACKETS

A. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
   1. Thickness: 0.016”.
   2. Finish: Smooth.
   3. Metal Jacket Bands: 3/8” wide; 0.010” thick stainless steel.

B. Lineset Covers
   1. Manufacturers
      a. Fortress
      b. SpeediChannel
      c. SlimDuct
      d. Approved equal
   2. Sized to cover refrigerant piping and insulation.
   3. Zinc-coated sheet metal ducting. SlimDuct RD-series or approved equal.
   4. UV-, fire-, and weather-resistant ivory-colored extruded PVC covers; SlimDuct SD-Series or approved equal.
   5. Standard color as selected by Architect

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Slope condensate piping to drain. Where air gaps are utilized cut condensate piping termination at 45 degree angle.

D. Install piping to conserve building space and avoid interference with use of space.

E. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.5.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.
4. Place hangers within 12" of each horizontal elbow.
5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.
8. Provide vibration isolation hangers for all refrigeration piping. Refrigeration piping shall not be attached to the building structure.

H. Arrange piping to return oil to compressor. Slope horizontal piping 0.40 percent in direction of flow.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access to concealed valves and fittings.

K. Flood copper piping system with nitrogen when brazing.

L. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

M. Follow ASHRAE Standard 15 procedures for charging and purging of systems and for disposal of refrigerant.

N. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

O. Fully charge completed system with refrigerant after testing.

P. Mitsubishi VRF Systems:
1. Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer’s installation manual for full instructions.
2. Traps, filter driers, and sight glasses are NOT to be installed on the refrigerant piping or condensate lines.

Q. Exterior Insulation Applications: Cover with lineset covers or stainless steel jacket with seams located on side of horizontal piping, lapped so that water cannot enter; make watertight.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen according to manufacturer’s installation instructions and warranty requirements. Test to no leakage.

END OF SECTION

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct Materials
B. Ductwork Fabrication
C. Manufactured Metal Ductwork and Fittings
D. Kitchen Hood Exhaust Ductwork
E. Duct Cleaning

1.2 RELATED REQUIREMENTS

A. Section 23 00 20 - Basic Materials And Methods for HVAC
B. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
C. Section 23 33 00 - Air Duct Accessories.
D. Section 23 37 00 - Air Outlets and Inlets.
E. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
F. Division 31 - Excavation, Fill, Trenching.

1.3 REFERENCE STANDARDS

A. ASTM A 36 - Standard Specification for Carbon Structural Steel.
B. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.
G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.
H. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
J. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines.
K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.

L. All codes and reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission of the Architect and Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. Meet or exceed SMACNA requirements for all sheet metal systems.

B. Leakage Testing General Requirements: Maximum permissible leakage shall be as noted in the Washington State Energy Code, or as noted in these specifications, whichever is more stringent.

1.5 SUBMITTALS

A. Product Data: Provide data for all materials.

B. Shop Drawings: Indicate ducts, fittings, and particulars such as gage, sizes, welds, and configuration prior to starting work on systems. Duct design pressure rating is posted on contract drawings, shop drawings shall reflect pressure class as shown. Shop drawings are to clarify duct routing taking into consideration structural members, electrical equipment, and other mechanical equipment. Contractor to submit shop drawings for review.

C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

D. Manufacturer's Installation Instructions.

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, 90B, 96 and SMACNA standards.

1.8 FIELD CONDITIONS

A. Do not install lined duct in wet locations. Contractor to keep ends of lined duct covered at all times. If lined duct becomes wet or dirty, remove from jobsite and replace with new duct. The General Contractor to provide weather protection if his schedule requires the sheet metal subcontractor to working ahead of the building being dried in.

B. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

C. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 DUCT ASSEMBLIES

A. Provide duct assemblies as shown on Plans.

2.2 MATERIALS

A. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, ASTM A 653 FS Type B, with G60/Z180 coating.

B. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 304.

C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.
   3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.

D. Insulated Flexible Ducts:
   1. Manufacturers:
      a. Thermaflex Model G-KM
      b. Approved equal
   2. Chlorinated polyethylene core supported by helically wound coated spring steel wire; fiberglass insulation; black polyethylene vapor barrier film.
      a. Pressure Rating: 6" wg positive and 1" wg negative.
      b. Maximum Velocity: 5000 fpm
      c. Temperature Range: -20 degrees F to 200 degrees F continuous.
      d. R-4.2, meeting UL 181, & NFPA 90A - 90B fire codes, self-extinguishing.
      e. GREENGUARD certified for Children and Schools.
      f. Acoustically rated.
      g. Warranted for 10 years
      h. Maximum length 6'.
      i. Install per manufacturer's recommendations.
      j. Run insulated flexible duct as straight as possible.

E. Stainless Steel Ducts: ASTM A 666, Type 304.

F. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

G. Type II Hood Exhausts : -2” w.g. pressure class Stainless Steel.
   1. For exhaust ductwork from hoods for cooking or dishwashing appliances that produce heat, steam or products of combustion and do not produce grease or smoke, such as steamers, kettles, pasta cookers, and dishwashing machines.
   2. Construct of 18 gage stainless steel using continuous external welded joints in rectangular sections. Provide neoprene gaskets at flanged connections.
   3. Fire dampers in wet air exhaust shall be of stainless steel construction.
   4. Construct of galvanized steel, constructed, joined and sealed in an approved manner.

5. Slope ductwork to drain back to hood. Where it is not possible for duct to be self-draining back to the equipment, provide low point drain pocket with copper drain pipe to sanitary system using appropriate air gap fitting. Provide access door in side of duct at drain pockets.

H. Dryer Ductwork: Galvanized Steel.
1. Ductwork shall be smooth round. Spiral ductwork is not allowed:
2. Fabricate in accordance with SMACNA HVAC Duct Construction Standards. Screws shall not penetrate airstream more than 1/8”.

I. Supply/Outside air/exhaust air/return air: +/-2” w.g. pressure class, galvanized steel.

J. Hanger Rod: ASTM A 36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

E. T's, bends, and elbows: Construct according to SMACNA (DCS).

F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

H. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

I. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide minimum 12" long plenum same size as the louver, sloped to drain to the exterior. Line plenum with self-adhering rubberized asphalt flashing as shown on Plans; seal plenum to louver frame and duct. Connect duct to plenum with 45 degree divergence fittings.

J. Contractor may use the Ductmate connection system at his option. System consists of flanges with integral sealants, corner pieces, clips, bolts, cleats and gaskets.

2.4 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacturers
1. Metal-Fab, Inc.
2. SEMCO Incorporated

3. United McGill Corporation
4. Local shop fabrication by installing contractor.
5. Approved equal

B. Manufacture in accordance with SMACNA HVAC Duct Construction Standards as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated on drawings.

C. Single Wall Round Duct And Fittings: Materials shall be per SMACNA HVAC Duct Construction Standards, Metal and Flexible, Galvanized Sheet Metal. Provide spiral duct.

D. Flat Oval Ducts: Machine made from round spiral lockseam duct.
1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Fittings: Manufacture at least two gages heavier metal than duct.
3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Provide additional reinforcing where duct is used in negative pressure applications. Utilize SMACNA reinforcing requirements for rectangular duct.
4. Manufacturers:
   a. United McGill Corporation
   b. Approved equal

E. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 1” (25 mm) thick fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
1. Provide additional reinforcing where duct is used in negative pressure applications. Utilize SMACNA reinforcing requirements for rectangular duct.
2. Manufacturers:
   a. United McGill Corporation
   b. Approved equal

F. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1” thick fiberglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.
1. Manufacturers:
   a. United McGill Corporation Model K27.
   b. Approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. General:
1. Install in accordance with manufacturer's instructions.
2. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
4. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
5. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
6. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
7. Use crimp joints with or without bead for joining round duct sizes 8" and smaller with crimp in direction of air flow.
8. Use double nuts and lock washers on threaded rod supports. Cut rods flush with second nut.
9. Connect diffusers to low pressure ducts directly or with 6' maximum length of flexible duct held in place with strap or clamp.
10. The sheet metal contractor shall protect the fabric duct to assure that the system is clean on completion of installation and at project acceptance.
11. Dryer duct shall terminate at the building exterior with a backdraft damper. Do not install with screws that penetrate into the duct airstream. Do not install screens in the duct or at termination.
12. At exterior wall louvers, provide minimum of 12" long plenum same size as louver and sloped to the exterior. Plenum shall be lined with self-adhering rubberized flashing as detailed on Plans. Seal plenum to louver. Connect duct to plenum with 45 degree divergence.

3.2 CLEANING

A. Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Repair any damage caused to duct lining caused by cleaning operation.
   1. Duct cleaning required, when contractor fails to protect duct prior to installation and or keep ends covered once duct is installed.

B. Remove all labels from exposed ductwork, including ductwork in mechanical spaces. Labels may remain on ducts in concealed locations only.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Backdraft Dampers
B. Dryer Vent Box
C. Duct Access Doors
D. Duct Test Holes
E. Fire and Smoke Dampers
F. Flexible Duct Connections
G. Motorized Dampers
H. Remote Access For Volume Control Dampers
I. Sleeves For Ducts Through Non-Fire-Rated Walls
J. Volume Control Dampers

1.2 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
B. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences.
C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.
E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.
F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.
G. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

1.7 EXTRA MATERIALS

A. Provide six (6) of each size and type of fusible link used on this project.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Manufacturers:
1. Greenheck Fan Corporation
2. Louvers & Dampers, Inc.
3. Nailor Industries Inc.
4. Ruskin Company
5. Approved equal

B. Gravity Backdraft Dampers, Size 18” x 18” or smaller, furnished with air moving equipment shall be air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Backdraft Dampers - Vertical:
1. Maximum Leakage: 15 cfm @ 1”. w.g. Tested in accordance with AMCA standard 500-D.
2. Maximum Differential Pressure Rating: 2.5” w.g.
3. Maximum Velocity Rating: 2000 feet per minute
4. Construction:
a. Damper Frame: 0.063” extruded aluminum
b. Blades: 0.050” extruded aluminum, 6” maximum blade width
c. Blade Edge Seals: Vinyl, mechanically fastened to blade
d. Linkage: Plated steel.
e. Axles:. Aluminum
f. Bearings: Synthetic polycarbonate
g. Finish: Mill finish
5. Counter-Balance required for applications that do not include forced air (i.e. do not have a fan).
6. Similar to Greenheck ES series.

D. Heavy-Duty Gravity Backdraft Dampers - Vertical:
1. Maximum Leakage: 10 cfm @ 1”. w.g. Tested in accordance with AMCA standard 500-D.
2. Maximum Differential Pressure Rating:10” w.g.
3. Maximum Velocity Rating: 3500 feet per minute
4. Construction
a. Damper Frame: 0.125” extruded aluminum
b. Blades: 0.070” thick aluminum 6” maximum blade width. Include Counter-Balance weights and adjustment mechanism
c. Blade Edge Seals: Vinyl, mechanically fastened to blade
d. Linkage: Plated steel
e. Axles: Aluminum

f. Bearings: Synthetic
g. Finish: Mill finish

5. Similar to Greenheck EM Series

2.2 DRYER VENT BOX

A. Manufacturers
1. In-O-Vate Technologies
2. Construction Solutions
3. Approved equal.

B. Aluminized or powder-coated steel box for terminating clothes dryer flex hose.

C. Provide box with 1-hour fire rating at 1-hour rated walls.

D. Locate at exhaust duct from dryer. Coordinate location at rough-in so not to interfere with other trades later on.

2.3 DUCT ACCESS DOORS

A. Manufacturers:
1. Acudor Products Inc.
2. Greenheck Fan Corporation
3. Nailor Industries Inc.
4. Ruskin Company
5. Approved equal

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1" thick insulation with sheet metal cover.
1. Less Than 12" Square: Secure with sash locks.
2. Up to 18" Square: Provide two hinges and two sash locks.
3. Up to 24" x 48": Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.5 FIRE AND SMOKE DAMPERS

A. Manufacturers:
1. Greenheck Fan Corporation
2. Louvers & Dampers, Inc.
3. Nailor Industries Inc.
4. Ruskin Company
5. Approved equal

B. Combination Fire and Smoke Dampers (CFSD)
1. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
2. Provide factory sleeve and collar for each damper. Minimum sleeve length 17".

3. Multiple Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2" actuator shaft. Similar to Greenheck FSD.
4. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on interior of duct and link to damper operating shaft.
5. Electronic Fuse Link (EFL): EFL shall activate at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.
6. Access panels for combination fire smoke dampers shall have a phenolic label on the exterior access panel stating "Combination Fire Smoke Damper" in a minimum of 3/8" high letters. The label shall also list a specific identifier for each CFSD, either in conjunction with a fire life safety monitoring and testing system, or as a stand-alone system. Minimum size of access panel is 12" x 12".
7. Grille-Access Out-of-Wall CFSD: Actuator is accessible by removing grille; similar to Greenheck GFSD.
8. Accessories and Options:
    a. Provide end switches to indicate damper position.
    b. Open/Closed indicator
    c. Smoke detector
    d. Resettable Link

2.6 FLEXIBLE DUCT CONNECTIONS

A. Wherever ducts make connection with any air-handling device such as supply fans, exhaust fans, etc., flexible connections shall be provided.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 ounces per square yard.
2. Net Fabric Width: Approximately 2" wide.

2.7 MOTORIZED DAMPERS

A. See Section 23 09 13 Instrumentation and Control Devices for HVAC.

B. All motorized dampers shall be installed under this specification unless specified as a standard integral component of a particular piece of equipment, e.g., packaged kitchen heat recovery unit. Installation shall be under the supervision of the Automatic Temperature Control Contractor.

C. Dampers shall be full size of duct, be sealed between damper frame and duct, and shall operate without binding on duct wall. Provide access panels for motorized dampers, 12" x 12" minimum.

D. Where motorized dampers are installed in fiberglass ductwork, provide sheet metal sleeve that also contains the access noted above.

2.8 REMOTE ACCESS FOR VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Ventlock
2. Young Regulator
3. United Enertech
4. Approved equal

B. Provide Ventlock Model 666 concealed damper regulator, where dampers are located above a hard lid ceiling or are otherwise inaccessible.

2.9 SLEEVES FOR DUCTS THROUGH NON-FIRE-RATED WALL

A. Provide sheet metal sleeves around ducts, penetrating through walls or floors. Pack opening around duct with fiberglass and caulk with resilient acoustical caulk and then install 3" x 3" - 18 gage sheet metal closure angle all around duct, overlapping corners, secure to duct and wall. Caulk and install closure angle on both sides of wall. When insulated on the exterior, butt to closure angles. See Section 07 84 00 for Fire Caulking requirements, Fire Caulking installation by Section 07 84 00 Subcontractor or General Contractor.

2.10 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc.
2. Nailor Industries Inc.
3. Ruskin Company
4. Greenheck Fan Corporation
5. Approved equal

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Volume Control Dampers, shall be installed on all branch duct take-offs to diffusers, grilles and registers. Do not provide or use dampers at the face of the diffuser, grilles or registers for balancing.

D. Splitter Dampers:
1. Material: Same gage as duct to 24" size in either direction, and two gages heavier for sizes over 24".
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
3. Operator: Minimum 1/4" diameter rod in self aligning, universal joint action, flanged bushing with set screw .

E. Single Blade Dampers: Fabricated for duct sizes up to 6" x 30"

F. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8" x 72". Assemble center and edge crimped blades in galvanized channel frame with suitable hardware.

G. End Bearings: Except in round ducts 12" and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

H. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30", provide regulator at both ends.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide additional backdraft dampers on exhaust fans or exhaust ducts nearest to the outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8" x 8" size for hand access, 18" x 18" size for shoulder access, and as indicated. Provide 4" x4" for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install combination smoke and fire dampers in accordance with NFPA 92A.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent the equipment.

I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

J. Provide balancing/volume dampers on all branch duct take-offs to diffusers, grilles, and registers. These will be used in addition to dampers at the face of the devices.

END OF SECTION

SECTION 23 34 23

HVAC POWER VENTILATORS - CENTRIFUGAL AND AXIAL FANS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof Exhausters.

B. Cabinet and Ceiling Exhaust Fans.

1.2 RELATED REQUIREMENTS

A. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

1.3 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.

B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.

F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.

H. UL 705 - Power Ventilators; Underwriters Laboratories Inc.

I. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.7 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Greenheck
B. Loren Cook
C. Panasonic
D. Fantech
E. PennBarry
F. ACME
G. Twin City Blower
H. Approved equal

2.2 ROOF EXHAUSTERS

A. Product Requirements:
   1. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

B. Performance Ratings:
   1. See Schedule on Plans.

C. Fan Unit: V-belt or direct-driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2" mesh, 0.062" thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

D. Roof Curb: Self-flashing galvanized steel with continuously welded seams and built-in cant strips. Curb is to bear on roof deck, with top minimum 12" above finished roof level. See Plans for details.

E. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor .

F. Solid-state speed controller.

G. Variable speed motor - electronically commutated motor (ECM)
   1. Greenheck Vari-Green
   2. Approved equal

H. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

I. Motorized Damper: Line-voltage or low-voltage motor drive, power open and spring return.

2.3 CABINET AND CEILING EXHAUST FANS

A. Performance Ratings:
1. See Schedule on Plans.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.

D. Grille: Molded white plastic.

E. Speed Controller: Provide speed controllers for all direct drive cabinet and ceiling exhaust fans. Speed controllers are for the purpose of balancing exhaust air quantities and shall be factory mounted on the fan housing.

F. Variable speed motor - electronically commutated motor (ECM)
1. Greenheck Vari-Green
2. Approved equal

G. Motorized Damper: Line-voltage or low-voltage motor drive, power open and spring return.

H. Backdraft Damper: Gravity actuated, aluminum construction, felt edged with offset hinge pin, nylon bearings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with stainless steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Fans:
1. Install fans with vibration mounts and with flexible electrical leads.
2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Install backdraft dampers on inlet to roof and wall exhausters.

F. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

3.2 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Prepare a manufacturer's startup report and turn over to the Owner and Commissioning Agent.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rectangular Ceiling Diffusers.
B. Ceiling Exhaust and Return Registers/Grilles.
C. Ceiling Grid Core Exhaust and Return Registers/Grilles.
D. Wall Supply Registers/Grilles - Heavy Duty
E. Wall Supply Registers/Grilles.
F. Wall Exhaust and Return Registers/Grilles.
G. Louvers, Mechanical.
H. Roof Hoods.

1.2 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.
B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute.
C. ASHRAE Standard 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
E. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, throw, drop, terminal velocity and noise level.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.
B. Test and rate air outlet and inlet performance in accordance with ASHRAE Standard 70.
C. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Grilles/Registers/Diffusers
1. Titus
2. Price Industries
3. Kees
4. Krueger
5. Carnes Company
6. Tuttle & Bailey
7. Approved equal

B. Louvers/Louvered Penthouses
1. Ruskin Manufacturing
2. Greenheck
3. Carnes Company
4. Loren Cook
5. Approved equal

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Frame: Surface mount type.

C. Accessories: Provide radial opposed-blade, butterfly, and combination splitter volume control damper; removable core, sectorizing baffle, equalizing grid, operating rod extension, anti-smudging device, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

D. Fabrication: Steel with baked enamel off-white finish.

2.3 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2” x 1/2” x 1/2” grid core.

B. Fabrication: Grid core consists of aluminum with mill aluminum finish.

C. Frame: 1-1/4” margin with countersunk screw mounting.

D. Frame: Channel lay-in frame for suspended grid ceilings.

E. Accessories:
1. Provide integral gang and face operated opposed-blade damper.
2. Provide with filter frame.

2.4 WALL SUPPLY REGISTERS/GRILLES - HEAVY DUTY

A. Type: Heavy duty aluminum solid airfoil blades, 3/4" minimum depth, 1-1/4” spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4" margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frames and heavy duty solid aluminum blades, with factory off-white enamel finish.

D. Accessories: Provide integral gang and face operated opposed-blade damper.

2.5 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with deflection as listed in the schedule.

B. Frame: 1-1/4" margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

2.6 WALL EXHAUST AND RETURN REGISTERS/GRILLES - HEAVY DUTY

A. Type: Steel grille with 3/8” bar spacing and 0°deflection.

B. Frame: 1-1/4" margin with countersunk screw mounting.

C. Fabrication: 16 gauge steel frames and 14 gauge steel blades, with factory off-white enamel finish. Bars shall be reinforced by perpendicular, steel support bars spaced on 6” maximum centers.

D. Accessories: Provide filter frame for a standard 1” filter to fit the specified duct size.

2.7 WALL LINEAR REGISTERS/GRILLES

A. Type: 1/8” thick fixed bars at 0 degrees or 15 degrees deflection, spaced on 1/4” or 1/2” centers.

B. Fabrication: Extruded aluminum bars locked into an extruded aluminum border, extruded aluminum end borders and mitered corners, with factory baked enamel finish.

C. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.8 DOOR GRILLES

A. Type: V-shaped louvers of 20 gage thick steel, 1” deep on 1/2” centers.

B. Frame: 20 gage steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

C. Color and finish type to be selected by Architect.

D. Equal to Titus CT-700L.

2.9 WEATHERPROOF LOUVERS

A. Louvers shall be furnished for installation in exterior walls as shown on the Plans. Louver blades shall be fabricated from anodized aluminum or galvanized steel sheets, and shall be provided with a frame of galvanized steel or aluminum structural shapes. Sheet metal thickness and fabrication shall conform to SMACNA HVAC Duct Construction Standards-Metal and Flexible. Blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Louver shall be provided with bird screen. Louvers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

B. Louver Types

1. 5” deep, extruded aluminum, Wind Driven Rain Louver, Equal to Greenheck EVH-501
   a. Frame

1) Downspouts and caulking surfaces provided.
2) Wall Thickness: 0.081" nominal.

b. Blades:
1) Vertical rain resistant style, ¾” spacing
2) 6005-T5 extruded aluminum.
3) Wall Thickness: 0.050" nominal.

c. Screen: 3/4" x .051" expanded, flattened aluminum bird screen in removable frame. Screen adds approximately 1/2" to louver depth.

d. Mounting: Furnish with screw holes in jambs.

e. Finish: Architect/Owner to select finish from manufacturer’s standard finishes.

f. Performance: Beginning point of water penetration shall be above 1250fpm free area velocity. Pressure drop shall be 0.15”WG at 900fpm free area velocity.

g. Variations
1) Extended sill.
2) Integral flange for face installation.
3) Front or rear security bars.

2.10 ROOF HOODS

A. Low silhouette ventilator for relief or intake applications with natural gravity or negative pressure system.

1. Hood and Base:
a. Material Type: Aluminum
b. Hood Constructed of precision formed, arched panels with interlocking seams
c. Birdscreen: Constructed of 1/2”inch aluminum mesh, mounted horizontally across the intake area of the hood.
d. Hood Support: Constructed of galvanized steel and fastened so the hood can either be removed completely from the base or hinged open

2. Provide the following Options and Accessories:
a. Roof Curbs:
1) Mounted onto roof with hood
2) Material: Aluminum
3) Insulation thickness: 1”
4) Curb Seal: Rubber seal between fan and the roof curb

b. Dampers:
1) Type: Gravity or motorized as shown on Plans.
2) Galvanized frames with prepunched mounting holes

c. Finishes: As selected by Architect from standard finishes.
d. Hood Insulation: 1” fiberglass insulation.
e. Tie-Down Points: Four aluminum brackets located on hood supports, secures fan in heavy wind applications

B. Spun Aluminum Intake or Relief Gravity Ventilator

1. General Description:

a. For intake applications with natural gravity or negative pressure system
b. Hood: Constructed of aluminum; internal structure is constructed of galvanized steel
c. Birdscreen: Constructed of 1/2” Aluminum mesh, mounted horizontally across the intake area of the hood.

2. Housing:
a. Curb Cap type: Hinged or Not Hinged
b. Constructed of aluminum, including windband and curb cap. Windband to be one piece spun aluminum construction and maintain original material thickness throughout the housing, and to include an integral rolled bead for strength
c. Curb cap to have integral deep spun inlet venturi and prepunched mounting holes.

3. Options/Accessories:
1) Curb Seal: Rubber seal between fan and the roof curb
a. Roof Curbs:
1) Mounted onto roof with fan
2) Material: Aluminum
3) Insulation thickness: 1”
b. Dampers:
1) Type: Gravity or motorized as shown on Plans.
2) Galvanized frames with prepunched mounting holes
3) Finishes: As selected by Architect from standard finishes.
c. Flashing Flange:
1) Constructed of aluminum
2) Pre-punched holes for installation without a roof curb
3) Hood Insulation: 1” fiberglass insulation.
4) Tie-Down Points: Four aluminum brackets located on windband
d. Reducer/Adapter:
1) Material type: Aluminum

B. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Mount unit on minimum 12" high curb base with insulation between duct and curb.

D. Install Roof Hoods level. Slope bottom of curb to match roof slope.

2.2 WALL CAPS

A. Aluminum construction hooded wall cap with integral duct connection.

B. Integral birdscreen and backdraft damper

C. Wall caps shall be installed and sealed to the building exterior in accordance with manufacture recommendations for the type of wall installed in.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Air Terminals
1. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
2. When installed in T-bar ceilings, provide pans as necessary.
3. Terminals installed in suspended ceiling systems shall be attached or supported as required by the latest appropriate Building Code for "Suspended Acoustical Ceilings."
4. Install diffusers to ductwork with air tight connections.
5. Install insulated diffuser boxes as detailed on the contract drawings.
6. Install grilles and registers to ductwork with air tight connections. Use screws and foil tape only; do not use duct tape.
7. Provide balancing/volume dampers on all branch duct take-offs to diffusers, grilles and registers.
8. Paint ductwork visible behind air outlets and inlets matte black.

C. Duct Openings: Where no grille, register, or diffuser is called out at duct openings, provide 1/2" hardware cloth over openings.

D. Louvers
1. Louvers shall be installed in exterior walls utilizing framed or masonry openings. The duct or plenum attached to the louver shall have the bottom surface sloped toward the louver and shall be rigidly secured and sealed watertight to the exterior wall, such that any entrained water will drain through the louver. The louver frame shall be sealed watertight to building surface. See details on Plans.
2. Install plumb, level, and free of rack and twist. Use only stainless steel fasteners to secure louvers to the building. Fasteners are to be removable from the exterior of the building.
3. Flashings as required by building architectural details are to be provided by G.C. Caulk and make watertight.
4. Provide 3" continuous galvanized closure angles and closure plates on inside head, inside jambs, and inside sill of exterior wall louvers. Caulk angles and plates prior to installation.
5. Install self-adhering rubberized asphalt flashing (Ice & Water Shield or approved equal) on the interior of plenum as shown on the Mechanical Details.
6. After installation, clean all exposed surfaces per manufacturer's recommendations and protect from damage until completion of project.

END OF SECTION

SECTION 23 38 13

HOODS, KITCHEN, DISH WASHER, KILN

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Type II - Kitchen Hood.

B. Residential Hood.

1.2 RELATED SECTIONS

A. Section 23 31 00: Ducts.

B. Section 23 33 00: Duct Accessories.

C. Section 23 34 23: Power Ventilators.

1.3 REFERENCES

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2006.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

D. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1999 (Ed. 2004).

1.4 SUBMITTALS

A. Product Data: Provide data for equipment required for this project.

B. Shop Drawings: Provide shop drawings for equipment required for this project.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include complete installation instructions.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than _five_ years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store products under cover and elevated above grade.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Greenheck Fan Corp.

B. K-Tech Industries.

C. Air King

D. Broan Manufacturing

E. Skutt Ceramic Products, Inc.

2.2 TYPE II - KITCHEN HOOD

A. General: Hood shall be a stainless steel, condensate hood. 18 ga, type 304 SS with No.4 finish on all exposed surfaces. For warming ovens, small auxiliary ranges not designed for heavy cooking, and for dishwashers.

B. Fabrication: Hood to be 36" Left to Right x 42" Front to Back x 24"H, (see drawings) - constructed of 18 gauge stainless steel with all external seams and joints welded, exposed welds ground and polished, condensate gutter around perimeter of hood with 1/2" diameter drain connection, NSF approved, ETL listed. Install brass plug if condensate gutter not used. Rod supports in each corner, double nut with lock washers.

C. Electrical: Provide hood light. Lights shall be UL listed and NSF approved for use in commercial cooking hoods. Each fixture shall accommodate a 100W incandescent bulb. Light switch to be mounted on the hood.

D. Accessories:

1. Also provide with stainless steel internal baffles, sloping to condensate gutter.
2. Stainless steel closure panels to ceiling.

2.3 RESIDENTIAL RANGE HOOD

A. General: Hood shall be Energy Star Certified, ducted with removable filter, integral fan, with controls mounted on the hood and remote switch, multispeed 250 CFM high, 150 CFM low.

B. Fabrication: Components shall be fabricated of stainless steel and hood width shall be 36" wide.

C. Electrical: Provide with 26W light, 4w night light, and 120v power to unit.

D. Accessories: Provide wall cap, or roof cap for location see contract drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide all controls and devices for a complete and operable system.

3.2 SYSTEMS STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Prepare and turn over to the owner and commissioning agent, a manufactures startup report.

END OF SECTION

SECTION 23 40 00

HVAC AIR CLEANING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Disposable, extended area panel filters.

1.2 REFERENCE STANDARDS

A. AHRI 850 - Performance Rating of Commercial and Industrial Air Filter Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

B. ASHRAE Standard 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. ASHRAE Standard 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

D. MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components, and Related Products: Performance-Test Methods; Military Specifications and Standards.

E. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to AHRI 850 Section 7.4.

B. Dust Spot Efficiency: Plus or minus 5 %.

1.4 SUBMITTALS

A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

B. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

D. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

E. Operation and Maintenance Data: Include a list of all filters and sizes provided, breakdown by individual pieces of equipment.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.6 EXTRA MATERIALS

A. Provide four sets of disposable MERV 8 filters, for each HVAC unit provided on project. One set to be used during construction. One set after the building is clean and prior to balancing. Deliver two sets to the owner for their installation as needed. Provide one additional set of MERV 13 filters for each piece of equipment that can be utilized during times of excessive wildfire smoke. Coordinate with the Owner, a location, to store the extra filters, prior to delivery. Provide the Owner with a Filter Inventory and an Installed Filter List arranged by quantity and size for each type of equipment provided. Provide copies of the Inventory and Installed Filter List to the Owner and include in the O & M manuals.

PART 2 - PRODUCTS

2.1 FILTER MANUFACTURERS

A. Camfil Farr Inc.

B. Eco-Air Products

C. Flanders Precision Aire

D. Vital Air

E. Approved equal.

2.2 DISPOSABLE PANEL FILTERS.

A. 2" Filter

1. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive. Filters to have a minimum efficiency reporting value of MERV 8 (ASHRAE Standard 52.2-1999) 25 to 30% efficiency.
   a. Nominal Size: 12 x 24” or as required by equipment provided.
   b. Thickness: 2" Filter.
   c. Equal to Camfil Farr 30/30.
2. Performance Rating:
   a. Face Velocity 500 FPM.
   b. Initial Resistance: .28" w.g.
   c. Recommended Final Resistance: 1.0" w.g.
   d. Guarantee the integrity of the filter pack to 2.0" w.g.
3. Casing: A high (28-point), wet-strength beverage board frame, with welded wire grid, spot welded and treated for corrosion resistance. The frame shall be bonded to the media to prevent air bypass.
4. Certification: Manufacturer shall provide evidence of facility certification to ISO 9001:2000, as a minimum.

B. 2" Filter :

1. Media: UL 900 Class 1, organic synthetic media, Filters to have a minimum efficiency reporting value of MERV 13 (ASHRAE Standard 52) 85 to 90% efficiency.
   a. Nominal Size: 24 x 24” or as required by equipment provided.
   b. Thickness: 2" Filter.
   c. Viledon Mini 85 or equal.

2. Performance Rating:
   a. Face Velocity 500 FPM.
   b. 43 sqft filter area for 2'x2' filter
   c. Initial Resistance: .26" w.g.
   d. Recommended Final Resistance: 1.5" w.g.
   e. Guarantee the integrity of the filter pack to 4.0" w.g.
3. Casing: Lightweight plastic with polyurethane seal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 74 14

PACKAGED OUTDOOR HEAT PUMP UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manufactured Packaged Roof Top Unit rate for 100% outside air.
B. Fabrication.
C. Electric Heating Coil.
D. Evaporator Coil.
E. Compressor.
F. Condenser Coil.
G. Mixed Air casing
H. Operating Controls.

1.2 RELATED REQUIREMENTS

A. Section 23 4000 - HVAC Air Cleaning Devices. Filter and trim.

1.3 REFERENCE STANDARDS

A. ARI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2006.
B. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.
C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2002.

1.4 SUBMITTALS

A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
B. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Filters: One set for each unit.

1.5 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Trane Company:

B. York International Corporation:

C. Mcquay International:

2.2 AIR CONDITIONING UNITS

A. General: Roof mounted units having electric heating elements and electric refrigeration. Unit shall be capable of operating with 100% outside air.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, fans, electric heating elements, and refrigerant heating coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Electrical Characteristics: See schedule.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

2.3 FABRICATION

A. Casings: Casing sections shall be 2” type constructed of a minimum 16-gauge galvanized steel, or 16-gauge steel outer casing protected with a corrosion resistant paint finish. All exterior surfaces shall be prime coated and painted at the factory, with a 5-year warranty against peeling and cracking. Casing shall be a reinforced galvanized steel panel with sealed joints. Each casing section handling conditioned air shall be insulated with not less than 2" thick, 3lb density coated fibrous glass material having a minimum R-value of 8.7. Factory applied fibrous glass insulation shall conform to ASTM C 1071, except that the minimum thickness and density requirements do not apply, and shall meet the requirements of NFPA 90A. Exposed insulation edges and joints where insulation panels are butted together shall be protected with a metal nosing strip or shall be coated to conform to meet erosion resistance requirements of ASTM C 1071.

B. Doors: Casings shall be provided with inspection doors, access sections, and access doors as indicated. Inspection and access doors shall be insulated, fully

gasketet. Doors shall be rigid and provided with heavy duty hinges and latches. Inspection doors shall be a minimum 12" wide by 12" high. Access doors shall be minimum 24" wide and shall be the full height of the unit section. Doors shall be provided with closed cell foam gasket. A latched and hinged inspection door shall be provided in the fan and coil sections. Additional inspection doors, access doors and access sections shall be provided where indicated.

C. Bases: Unit bases shall be constructed from ASTM A36 structural steel channel iron around the entire perimeter of the unit and provided with intermediate structural channel and angle iron as required to support all internal components.

D. Air Filters:
1. Holding Frames: Frames shall be fabricated form not lighter than 16-gauge sheet steel with rust-inhibitor coating. Each holding frame shall be equipped with suitable filter holding devices. Holding frame seats shall be gasketed. All joints shall be airtight.
2. Filter Gauges: Filter gauges shall be dial type, diaphragm actuated draft and shall be provided for all filter stations, including those filters which are furnished as integral parts of factory fabricated air handling units. Gauges shall be at least 3-7/8” in diameter, shall have white dials with black figures, and graduations and shall have a minimum range of 1" beyond the specified final resistance for the filter bank on which each gauge is applied. Each gauge shall incorporate a screw operated zero adjustment and shall be furnished complete with two static pressure tips with integral compression fittings, two molded plastic vent valves, two 5' minimum lengths of 1/4" diameter tubing, and all hardware and accessories for gauge mounting.

E. Dampers:
1. Damper Assembly: A single damper section shall have blades no longer than 48" and shall be no higher than 72". Maximum damper blade width shall be 8". Larger sizes shall be made from a combination of sections. Dampers shall be steel, or other materials where shown. Flat blades shall be made rigid by folding the edges. All blade-operating linkages shall be within the frame so that blade-connecting devices within the same damper section will not be located directly in the air stream. Damper axles shall be 0.5" (minimum) plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings. Pressure drop through dampers shall not exceed 0.04" water gauge at 1,000 fpm in the wide-open position. Frames shall not be less than 2" in width. Dampers shall be tested in accordance with AMCA 500-D.
   a. Damper Types: Dampers shall be of similar (parallel/opposed) blade type.
2. Outside Air, Return Air, and Relief-Air Dampers: The dampers shall be provided where shown. Blades shall have interlocking edges and shall be provided with compressible seals at points of contact. The channel frames of the dampers shall be provided with jamb seals to minimize air leakage. Dampers shall not leak in excess of 20 cfm per square foot at 4" water gauge static pressure when closed. Seals shall be suitable for an operating temperature range of -40 degrees to +200 degrees F. Dampers shall be rated at not less than 2000 fpm air velocity.

F. Fans: Fans shall be double-inlet, centrifugal type with each fan in a separate scroll or unhoused plenum type. Fans and shafts shall be dynamically balanced prior to installation into air handling unit, and then the entire fan assembly shall be statically and dynamically balanced at the factory after it has been installed in the air-handling unit. Fans shall be mounted on steel shafts accurately ground and finished. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000-hours as defined by AFBMA STD 9 and AFBMA STD 11. Bearings shall be permanently lubricated. Fans shall be driven by a unit mounted or a floor-mounted motor connected to fans by V-belt drive complete with belt guard for externally mounted motors. Belt guards shall be the three sided enclosed type with solid or expanded metal face. Belt drives shall be designed for not less than a 1.3 service factor based on motor nameplate rating. Motor sheaves shall be variable pitch. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable bases. Fan motors shall have totally enclosed enclosures. Motors equipped with VFDs shall be inverter duty with ISR windings and class F insulation. Unit fan or fans shall be selected to produce the required capacity at the fan static pressure. Fans shall be selected to maintain the required static pressure and capacity pending the future installation of cooling coils. Sound power level shall be as indicated. The sound power level values shall be obtained according to AMCA 300 or ASHRAE 68.

G. Access Sections and Filter/Mixing Boxes: Access sections shall be provided where indicated and shall be furnished with access doors as shown. Access sections and filter/mixing boxes shall be constructed in a manner identical to the remainder of the unit casing and shall be equipped with access doors. Mixing boxes shall be designed to minimize air stratification and to promote thorough mixing of the air streams.

H. Electrical: Units shall be single point power connection. Units shall be internally wired at the factory. Units shall be equipped with their own 120v transformer to operate the lights and convenience outlets where equipped. Lighting shall be provided with impact resistant coverings. All units shall be U.L. listed and labeled. Unit shall be provided with a GFCI convenience receptacle in each fan section. Motors shall be heavy duty open drip-proof, 3-phase, 1800 rpm, mounted on a heavy duty sliding base. Motor and blower assembly shall be mounted on a heavy steel frame supported by springs designed for 90 to 98 % isolation efficiency.

I. Test Ports: Provide sealed test ports for testing and balancing purposes. Test port plugs shall be removable and reinstallable for a weather tight seal.

J. Insulation: 2" thick neoprene coated glass fiber with edges protected from erosion.

K. Air Filters: 2" thick glass fiber disposable media in metal frames.

L. Roof Mounting Curb: Shall be provided with unit.

2.4 ELECTRIC HEATING COIL

A. Finned tube heating elements easily accessible with automatic reset thermal cut-out, built-in magnetic contactors, galvanized steel frame, control circuit

transformer and fuse, manual reset thermal cut-out, airflow proving device, toggle switch (pilot duty), load fuses.

2.5 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with stainless steel drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.6 COMPRESSOR

A. Provide semi-hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Outdoor thermostat to energize compressor above 35 degrees F ambient.

D. Provide step capacity control by cycling compressors.

E. For heat pump units, provide reversing valve, suction line accumulator, flow control check valve, and solid-state defrost control utilizing thermistors.

2.7 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

C. Provide refrigerant pressure switches to cycle condenser fans.

2.8 OPERATING CONTROLS

A. Provide with packaged operating controls. Controls shall be capable of operation at 100% outside air. Percentage of outside air shall modulate to maintain space pressure on each floor. Modulation shall occur when dryers activate. Unit shall provide make-up air for dryers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that the roof is ready to receive work and opening dimensions are compatible with unit.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Condensate Drainage: provide PVC P-traps on unit condensate drains with trap depth so as to prevent unit sucking in air through condensate drain.

D. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

END OF SECTION

SECTION 23 81 01

TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electric Unit Heaters

B. Electric Wall Heaters

1.2 RELATED REQUIREMENTS

A. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.3 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Manufacturer's Instructions: Indicate installation instructions and recommendations.

C. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 WARRANTY

A. Provide five (5) year manufacturer’s warranty on units, covering parts and labor.

PART 2 - PRODUCTS

2.1 ELECTRIC UNIT HEATERS

A. Manufacturers:
1. INDEECO (Industrial Engineering and Equipment Company)
2. Marley Engineered Products
3. Qmark
4. The Trane Company
5. Approved equal.

B. Assembly: UL listed and labeled assembly with terminal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Cabinet: 18 gage steel with easily removed front panel with integral air outlet and inlet grilles.

E. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

F. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard.

G. Motor: Permanently lubricated, sleeve bearings for horizontal models, ball bearings for vertical models.

H. Control: Separate fan speed switch and thermostat heat selector switch, factory wired, with switches built-in behind cover. Provide thermal overload. Thermostat shall be factory mounted tamper resistant.

I. Electrical Characteristics: See Schedule on Plans.
   1. Disconnect Switch: Factory mount disconnect switch.

2.2 ELECTRIC WALL HEATERS

A. Manufacturers:
   1. Cadet
   2. INDEECO (Industrial Engineering and Equipment Company)
   3. Marley Engineered Products
   4. Qmark
   5. Approved equal.

B. Fan forced electric air heaters shall be UL listed, self-contained and completely separate from the wall mounting can.

C. Construction
   1. Element: Nichrome-type wire wrapped on mica insulators with a 16 amp rated, at 240V, high temperature manual power reset limit switch, and a one-time over temperature thermal back-up fuse
   2. Blower: Two-stage centrifugal blower isolated from the heating chamber.
   3. Grille: One-piece, 20-gauge construction with powder coat paint.

D. Electrical Characteristics: See Schedule on Plans.

E. Options
   1. Provide with wall can.
   2. Provide with integral thermostat. Units in restrooms shall be complete with thermostat that operates for a set period of time at an elevated temperature and then reverts back to standard setpoint temperature automatically.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

E. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Division 26.

F. Wall mounted electric heaters shall be mounted at 12” AFF to the bottom of unit, unless otherwise noted.

3.2 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Prepare a manufacturer's startup report, and turn over to the Owner’s representative and commissioning agent.

3.3 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 23 81 19

SELF-CONTAINED AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged terminal heat pump units.

B. Cabinet.

C. Wall sleeves.

D. Louvers.

E. Chassis.

F. Controls.

1.2 RELATED REQUIREMENTS

A. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

C. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

A. Air Cooled Units: See schedule on Plans.

1.5 SUBMITTALS

A. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.

C. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 MOCK-UP

A. Install one unit that includes inside cabinet, wall sleeve, and wall louver.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.9 WARRANTY

A. Provide a five year manufacturer's warranty on units, covering parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ephoca

B. Approved equal

2.2 HEAT PUMP UNITS

A. Description: Packaged, self-contained, through-the-wall air cooled terminal heat pump units, with wall sleeve, room cabinet, electric refrigeration system, electric resistance heating, outside air louvers, energy recovery core, remoted temperature controls; fully charged with refrigerant and filled with oil.

B. Electrical Characteristics: See schedule on Plans.

C. Energy Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of Washington State Energy Code, or local jurisdiction energy code, whichever is the most stringent.

D. Sound data shall be as scheduled.

2.3 CABINET

A. Cabinet: Wall-mounted steel with powder coated white finish, removable front panel with concealed latches.

2.4 WALL SLEEVES AND LOUVERS

A. Wall Sleeves: Steel with protective coating.

B. Sidewall adapters: Provide where needed on drawings. Wire adapters to main heat pump

C. Louvers: Provide 8" diameter louvers, color and finish selected by Architect.

2.5 CHASSIS

A. Refrigeration System:
   1. Direct expansion cooling coil.
   2. Hermetically sealed compressor with internal spring isolation, external isolation.

3. Condenser coil and fan.

B. Air System: Supply fans with washable filters.

C. ERV: 40 CFM ERV capable of transferring both sensible and latent heat.

D. Heating Coil: Refrigerant main with additional electric strip heater.

E. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation. Separate condensate piping connection ¾”

F. Filter: Provide with washable air filter, Provide with optional MERV 13 filter for owner use during wildfire smoke events.

2.6 CONTROLS

A. Provide with programmable wall mounted advanced full color touch screen controller model TFTH20.

B. Unit shall be capable of operation through wifi enabled phone app.

C. Power outage restart: unit shall startup in last operated setting/function.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

C. Provide all accessories as needed for complete installation.

3.2 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Prepare a manufacturer’s startup report and turn over to the Owner and Commissioning Agent.

END OF SECTION

SECTION 23 81 27

SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manufactured Air-Source Split-System Heating and Cooling Units

B. Indoor Units for Ductless Systems

C. Outdoor Unit - Air Cooled Remote Condensing Unit

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Domestic Water Piping: Indoor coil condensate drain.

B. Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute.

C. ASHRAE Standard 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

D. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Including All Addenda (ANSI/ASHRAE)

E. ASHRAE Standard 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

I. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

J. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Design Data: Indicate refrigerant pipe sizing.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five (5) years of documented experience.

1.6 WARRANTY

A. Provide five year manufacturer’s warranty on units, covering parts and labor. Compressors shall have a warranty of seven years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mitsubishi

B. Fujitsu

C. Daikin

D. Approved equal.

2.2 SPLIT-SYSTEM HEATING AND COOLING UNITS

A. The Heat Pump system shall be split system with variable speed inverter compressor. The system shall consist of an outdoor unit, and a matched capacity indoor section that shall be equipped with a wired wall-mounted, remote controller.

B. Provide refrigerant lines between indoor and outdoor units, factory cleaned, dried, pressurized, sealed, and insulated. Provide insulation inserts as noted in Section 23 00 20.

C. Basis of design is Mitsubishi.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the remote controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry air before shipment from the factory.

B. Unit Cabinet: Casing shall be ABS plastic. Cabinet shall be designed for suspension mounting from above and horizontal operation. Indoor unit shall have removable mounting brackets. A mounting template with suspension bolt

locations shall be furnished with indoor unit. Mounting bolts or threaded rod of 3/8” diameter shall be used to suspend unit and unit shall not require direct contact with ceiling or panel for proper operation.

C. Fan: The indoor unit fan shall have multiple high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall have multiple speeds plus AUTO fan setting. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and sensed space temperature.

D. Vane: Unit shall include a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control, and swing. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.

E. Filter: Return air shall be filtered by means of an easily removable, washable filter.

F. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. Drain pan level switch, designed to connect to the control board, shall be provided and installed on the condensate pan to prevent condensate from overflowing. A drain lift mechanism (condensate pump), capable of lifting condensate 23-5/8” above the drain pan, shall be provided.

G. Electrical: The electrical power shall be as noted on Plans. Power to the indoor unit shall be supplied from the outdoor unit; wiring shall provide power feed and bi-directional control transmission between the outdoor and indoor units. If code requires a disconnect mounted near the indoor unit, a TAZ-MS303 3-Pole Disconnect shall be used – all three conductors must be interrupted.

H. Condensate Pump: Provide with manufacture provided condensate pump.

I. System Control:

1. The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.
2. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

J. Remote Controllers

1. Wired Remote Controller (PAR-21MAA)
   a. Include a built-in weekly timer with up to 8 pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature changes shall be by increments of 1°F. Controller shall have the capability of controlling up to a maximum of 16 systems, as a group with the same mode and set-point for all, at a maximum developed control cable distance of 1,500 feet. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices.
   b. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless or a wired controller, providing emergency operation and controlling the outdoor unit.
   c. Indoor units shall be equipped with an optional "i-see® Sensor" kit for automatic response to adjust the set temperature and provide uniform comfort from floor to ceiling.

2.4 OUTDOOR UNITS - AIR COOLED REMOTE CONDENSING UNIT

A. Outdoor Units: The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
   1. Comply with AHRI 210.
   2. Refrigerant: R-410A.
   3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Standard 23 and UL listed.

B. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units. System shall operate at up to a maximum refrigerant tubing length of 100 feet without the need for line size changes, traps or additional oil. Contractor to provide any additional required refrigerant for proper operation.

C. The outdoor unit shall be capable of cooling operation down to 0°F ambient temperature without additional low ambient controls (provide with wind baffle).

D. Cabinet
   1. Casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating.
   2. Provide mounting feet welded to the base of the cabinet, of sufficient size for stability.
   3. Provide with removable panel sections for servicing.
   4. The fan grill shall be of ABS plastic.
   5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas.

Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

E. Fan
1. Units shall be furnished with DC fan motor(s).
2. Fan blade(s) shall be of aerodynamic design, and the fan motor bearings shall be permanently lubricated.
3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard.

F. Coil
1. Condenser coil shall be of copper tubing with flat aluminum fins. The coil shall be protected with an integral metal guard.
2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV).The LEV shall be controlled by a microprocessor-controlled step motor.
3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than requirements of the Washington State Energy Code, or local jurisdiction energy code, whichever is more stringent.

G. Compressor
1. Compressor shall have variable speed inverter drive to control compressor speed. The compressor speed shall dynamically vary to match the room load.
2. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
3. The compressor shall be mounted to avoid the transmission of vibration.
4. The outdoor unit shall have an accumulator and high pressure safety switch.

H. Electrical
1. Power for the indoor unit shall be supplied from the outdoor unit.
2. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.
3. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

D. Verify equipment locations on the drawing, and in the field, do not exceed the manufacturer’s maximum refrigeration pipe length, including elevation and fitting allowance. MC to coordinate with GC, CC and EC, prior to rough-in.

E. Verify equipment wiring and coordinate with EC, some units have power to one location, with a intertie between units and others have power to both unit locations, with control intertie.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local Authorities Having Jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Condensate piping shall be sloped to drain. Piping terminated with an airgap shall be cut at a 45 degree angle.

D. Install refrigeration systems in accordance with ASHRAE Standard 15.

E. Pipe drain from condensate to nearest floor drain. Piping shall be cut at a 45 degree angle at the termination point.

F. Pressurize and test in accordance with manufacturer’s installation instructions and warranty requirements.

3.3 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire system.

C. Prepare a manufacturer’s startup report and turn over to the Owner and Commissioning Agent.

END OF SECTION

SECTION 23 81 29

VARIABLE REFRIGERANT FLOW (VRF) HVAC SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Variable capacity heat pump heat recovery air conditioning system.

1.2 RELATED REQUIREMENTS

A. Section 23 09 23.1 - Digital Controls - VRF System

B. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

C. Section 23 23 00 - Refrigerant Piping and Specialties

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute.

C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute.

D. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ANSI/ASHRAE)

E. NFPA 70 - National Electrical Code; National Fire Protection Association.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

G. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc..

H. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Standard 90.1.

B. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

C. Heating Capacity: See Schedule on Plans.

D. Cooling Capacity: See Schedule on Plans.

E. Scheduled Performance: ARI 210/240 Test Conditions. See schedule.

1.5 SUBMITTALS

A. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.6 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Equipment shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

D. All wiring shall be in accordance with the National Electrical Code (NEC).

1.7 QUALITY ASSURANCE

A. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

1.8 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.9 WARRANTY

A. Air Handlers and Condensing Units/Heat Pumps
   1. Units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.
      a. If the systems are designed by a certified CITY MULTI Diamond Designer, installed by a certified CITY MULTI Diamond Dealer, AND verified with a completed commissioning report submitted to Mitsubishi Electric Service Department, then the units shall be covered by an extended manufacturer's limited warranty for a period of five years from date of installation.
      b. In addition, the compressor shall have a manufacturer's limited warranty for a period of seven years from date of installation.
   2. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
   3. This warranty does not include labor.

B. Lossnay Ventilation Equipment

1. The Lossnay® units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
2. The Lossnay® Energy Transfer Core shall have an additional nine year warranty against defects in material or workmanship. The total warranty period shall be ten years from date of installation.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Basis of design is Mitusubishi CITY MULTI.

B. The CITY MULTI VRF system shall utilize the R2-Series (simultaneous cooling and heating) split system heat pump.

C. The R2-Series system shall consist of a PURY outdoor unit, BC (Branch Circuit) Controller, multiple indoor units, and M-NET DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. Each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

2.2 R2-SERIES OUTDOOR UNIT

A. General:

1. The R2-Series PURY outdoor unit shall be used specifically with CITY MULTI VRF components. The R2-Series shall consist of the PURY outdoor unit, Branch Circuit (BC) Controller, indoor units (-E models), and M-NET DDC (Direct Digital Controls). The PURY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
2. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
3. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.
4. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation.
5. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.

6. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
7. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
8. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
9. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
10. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
11. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls.
12. Low Ambient Operation
    a. The outdoor unit shall be capable of operating in cooling mode down to -10°F with optional manufacturer-supplied low ambient kit.
    b. Manufacturer-supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
    c. Manufacturer-supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
    d. Manufacturer-supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
13. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
14. The outdoor unit shall be provided with a manufacturer-supplied 20 gauge hot dipped galvanized snow/hail guard to protect the outdoor coil surfaces from hail damage and snow build-up.
15. Unit must defrost all circuits simultaneously.

B. Unit Cabinet:
1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Unit cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (-BS models).

C. Fan:
1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0” WG external static pressure, but capable of normal operation under a maximum of 0.24” WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant
1. R410A refrigerant shall be required for PURY-P-T/Y(S)KMU-A outdoor unit systems.
2. Polyolester (POE) oil shall be required.

E. Coil:
1. Nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. Factory applied corrosion resistant blue-fin finish on coil fins.
3. Protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. Four circuits with two position valves for each circuit, except for the last stage.

F. Compressor:
1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor.
2. Crankcase heater shall be factory-mounted on the compressor.
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
4. Equipped with an internal thermal overload.
5. Mounted so as to avoid the transmission of vibration.
6. Field-installed oil equalization lines between modules are not allowed.

G. Electrical:
1. Unit electrical power shall be as scheduled on Plans.
2. Unit shall be controlled by integral microprocessors.
3. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor twisted-pair shielded cable.

H. Controls:
1. The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system.

I. BS Coating
1. Outdoor unit shall be coated with the Seacoast Protection Coating (BS coating) if the installation site is within 0.62 miles of a seacoast.

2.3 BRANCH CIRCUIT (BC) CONTROLLERS FOR R2-SERIES SYSTEMS

A. General:
1. The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or sub-cooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be sub-cooled for optimal indoor unit LEV performance; alternate branch devices with no sub-cooling risk bubbles in liquid supplied to LEV and are not allowed.
2. The BC (Branch Circuit) Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board

that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

B. BC Unit Cabinet:
1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house two tube-in-tube heat exchangers.
4. Refrigerant shall be R410A.

C. Refrigerant valves:
1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and/or three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
2. Each branch shall have multiple two-position valves to control refrigerant flow.
3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

D. Integral Drain Pan: An integral condensate pan and drain shall be provided.

E. Future Use: Each VRF system shall include at least one (1) unused branch or branch device for future use. Branches shall be fully installed and wired in central location with capped service shutoff valve and service port.

F. Electrical:
1. Unit electrical power shall be as scheduled on Plans.
2. The BC Controller shall be controlled by integral microprocessors.
3. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor twisted-pair shielded cable to provide total integration of the system.

2.4 PKFY (WALL-MOUNTED) INDOOR UNIT

A. General:
1. The PKFY shall be a wall-mounted indoor unit section and shall have a modulating linear expansion device and a flat front. The PKFY shall be used with the R2-Series outdoor unit and BC Controller, Y-Series outdoor unit, or S-Series outdoor unit. The PKFY shall support individual control using M-NET DDC controllers.

B. Indoor Unit
1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit

and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. White finish
2. Multi directional drain and refrigerant piping offering four directions for refrigerant piping and two directions for draining shall be standard.
3. Separate back plate for securing the unit to the wall.

D. Indoor Fan:
1. Shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
2. Shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
5. Include factory-provided washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. Tubing shall have inner grooves for high efficiency heat exchange.
3. Tube joints shall be brazed with phos-copper or silver alloy.
4. Coils shall be pressure tested at the factory.
5. Condensate pan and drain shall be provided under the coil.
6. Both refrigerant lines to the PKFY indoor units shall be insulated.

F. Electrical:
1. Unit electrical power shall be as scheduled on Plans.
2. Connect condensate pump to power.

G. Condensate Pump:
1. Provide condensate pump capable of being wired to indoor unit.

H. Controls:
1. This unit shall use controls provided by Mitsubishi Electric Cooling and Heating to perform functions necessary to operate the system. Reference Section 23 09 23.1.
2. The unit shall be able to control external backup heat.
3. The unit shall have a factory built in receiver for wireless remote control.
4. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
5. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
6. Indoor unit shall include no less than four digital inputs capable of being used for customizable control strategies.
7. Indoor unit shall include no less than three digital outputs capable of being used for customizable control strategies.

2.5 PEFY-NMAU (CEILING-CONCEALED DUCTED) INDOOR UNIT

A. General:
1. The PEFY shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The PEFY shall be used with the R2-Series outdoor unit and BC Controller, Y-Series outdoor unit, or S-Series outdoor unit. The PEFY shall support individual control using M-NET DDC controllers.

B. Indoor Unit.
1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. The unit shall be, ceiling-concealed, ducted.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:
1. PEFY-NMAU models shall feature external static pressure settings from 0.14 to 0.60 in. WG.
2. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
3. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
4. The indoor fan shall consist of three speeds, High, Mid, and Low plus the Auto-Fan function
5. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:
1. Return air shall be filtered by means of a standard factory installed return air filter.
2. Retun filter box (rear or bottom placement) with high-efficiency filter shall be available for all PEFY indoor units.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Both refrigerant lines to the PEFY indoor units shall be insulated.
8. Provide condensate drain pan overflow switch to disable unit upon activation, model #DPLS1

G. Electrical:
1. Unit electrical power shall be as scheduled on Plans.

H. Condensate Pump:
1. Provide condensate pump capable of being wired to indoor unit.

I. Controls:
1. This unit shall use controls provided by Mitsubishi Electric Cooling & Heating to perform functions necessary to operate the system. Reference Section 23 09 23.1.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three digital outputs capable of being used for customizable control strategies.

2.6 LOSSNAY VENTILATION SYSTEM (HEAT EXCHANGER)

A. General
1. The fresh air ventilation system(s) shall utilize the Mitsubishi Electric LOSSNAY total heat exchanger with outside air bypass damper and energy recovery ventilation. These units shall be selected in accordance with the building ventilation requirements.
2. The ventilation equipment shall be Energy Recovery Ventilator (s) (ERV) as manufactured by Mitsubishi Electric (From now on referred to as “Lossnay® ERV”).
3. The Lossnay® ERV equipment shall form part of the Mitsubishi Electric City Multi HVAC system and will supply ventilation air to all indicated indoor zones served by the City Multi HVAC system.
4. The Lossnay® ERV shall be equipped with an M-Net data network control and will be directly connectable to the City Multi M-Net Data communication control network and will be able to be electronically interlocked with City Multi indoor units.

B. General
1. The ERV unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, control circuit board and blowers with motors, filters, and insulated foam air guides. Each unit will have an automatic by-pass damper system for economic operation under certain conditions. The unit shall have factory installed control board with functions for local, remote, and optional control modes.

C. Unit Cabinet: The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached

D. Blowers:

1. The unit shall be furnished with two (except LGH-F1200RX3-E shall be furnished with four) direct-drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow.
2. The blower motors shall be directly connected to the blower wheels and have permanently lubricated bearings.
3. The blowers and motors shall be mounted for quiet operation.

E. Heat Exchanger
1. The Lossnay® heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible plus latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.
2. The Lossnay® element shall have protective filters installed at both the supply and exhaust sides with an access cover to allow easy maintenance.

F. Bypass Damper
1. The ERV shall have an automatic supply side by-pass damper to allow inbound ventilation air to by-pass the Lossnay® energy transfer core when outside weather conditions warrant.
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to an mechanical damper flap to allow fresh air to bypass the Lossnay® element.
3. Supply and return air thermistor shall control the damper and may be interlocked with a Mitsubishi Electric PZ Series LCD remote controller.

G. Filters
1. The ERV shall be equipped with factory installed air filters located at each intake face (both supply and exhaust sides) of the Lossnay® core.

H. Mounting
1. Mounting of the Lossnay® ERV shall be as indicated in the plans and drawings. The ERV shall not require and condensate pan or receptacle nor condensate drain or piping. Mounting may be horizontal or vertical and the unit may be inverted as required by ductwork connection.

I. Control
1. This equipment shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system. Reference Section 23 09 23.1.

J. Preheater
1. A suitable pre-heater shall be supplied and installed to pre-heat and maintain the air temperature entering the Lossnay® ERV to above 14°F.
2. The heater shall be sized to increase the temperature of the incoming supply air based on the heating (winter) design condition of the applicable site.
3. In the case where the outside air is mixed into the return air of a CITY MULTI indoor unit the pre-heater will be sized so that the mixed air temperature of return and ventilation air is always greater than 55°F.

4. The pre-heater shall be installed according to the manufacturer’s recommendation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
1. A full charge of R-410A for condensing unit(s) only is to be provided in the condensing unit by the manufacturer. Additional refrigerant required for system operation is to be provided by Contractor.
2. The City Multi VRF system shall be installed by a Mitsubishi authorized City Multi Diamond Dealer with extensive City Multi install and service training. The mandatory contractor service and install training should be performed by the manufacturer.
3. Provide a factory-trained technician to be on site to coordinate with the EMCS contractor, to ensure operability of control systems.
4. Installation, commissioning and testing shall be carried out by licensed installers in accord with all Codes and requirements.
5. The installation of all Lossnay® units, duct work, all interconnecting control and power wiring, commissioning and testing shall be carried out by licensed installers in accord with all Codes and requirements.
6. The installer shall supply, install, test and commission all interconnecting ductwork for the Lossnay® ERV units.
7. Slope outside air and exhaust air ductwork from Lossnay® ERV units toward building exterior.

B. Third Party Controls: Installing contractor shall coordinate all BAS/BMS control requirements and connections with controls contractor.

C. Commissioning
1. Provide building commissioning support as specified in Section 23 08 00.

D. Equipment Manufacturer's Participation In Project Commissioning
1. Assist in developing the final functional test procedures as specified in Section 23 08 00.
2. Provide authorized startup technician to perform functional performance testing as specified in Section 23 08 00.
3. Provide building commissioning support as specified in Section 23 08 00.

END OF SECTION

SECTION 23 82 16

AIR COILS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electric Duct Heaters

1.2 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings: Installation of duct coils.

B. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; Air-Conditioning, Heating, and Refrigeration Institute.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; Including All Applicable Amendments and Supplements.

D. Reference standards shall be the latest revision as accepted by the local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.7 WARRANTY

A. Provide a five (5) year manufacturer warranty on units, covering parts and labor.

PART 2 - PRODUCTS

2.1 ELECTRIC DUCT HEATERS

A. Manufacturers:
1. INDEECO
2. Markel
3. Brasch
4. Greenheck
5. Approved equal

B. General: Voltage, size, KW, steps and control voltage shall be as scheduled on Plans. Three phase heaters shall have balanced phases.
1. Heaters shall be UL Listed for zero clearance an shall meet all NEC requirements.
2. Elements:
   a. Open coil heating elements shall be 80% nickel and 20% chromium; steps shall be arranged to prevent stratification when operating at less than full capacity. Elements for draw-through air handling units shall be de-rated to 35 watts per square inch; blow-through air handling coils and variable volume reheat coils shall be de-rated to 25 watts per square inch.
   b. Elements for Finned Tubular heaters shall have fins brazed to tubular sheath. Element wire shall be 80/20 Ni-chrome. Elements shall be protected against corrosion by a high-temperature aluminum coating. Terminals shall be sealed with silicone rubber to protect against moisture.
3. Construction:
   a. Element terminals shall be stainless steel; insulators and bracket bushings shall be nonporous ceramic and securely positioned. Terminals shall be machine crimped to elements.
   b. Frame shall be constructed of heavy gauge galvanized steel with galvanized steel brackets, stiffening ribs and gussets spot welded to the frame.
   c. Terminal box shall be spot welded construction with solid, hinged cover, totally enclosed, without louvers or grilles per the UL Standard.
   d. Recessed terminal box to be provided when coils are installed in ducts with internal insulation or obstruction greater than 1".
4. Direction of airflow: heaters shall be interchangeable for horizontal left or right or vertical up airflow except when position sensitive mercury contactors or SCRs are built-in. In these cases, airflow direction shall be as scheduled.
5. Safety devices:
   a. Disc-type automatic reset thermal cutout shall be furnished for primary over-temperature protection.
   b. For secondary protection, a sufficient number of replaceable thermal cutouts in the power lines shall de-energize elements if the primary cutout fails.
   c. All safety devices shall be serviceable through the terminal box without removing the heater from the duct.

6. Wiring diagrams: a unique wiring diagram shall be furnished for each heater. Diagram shall include recommended supply wire gauges per NEC and fuse sizes. Typical wiring diagrams are not acceptable.
7. Built-in components:
   a. Safety interlocking disconnect switch
   b. Disconnecting break magnetic contactors
   c. Transformer with primary fusing per UL
   d. Pressure-type airflow switch set at 0.05" WC
   e. Supplementary circuit fuses per NEC (one set of fuses per 48 amp circuit)
   f. Separate load and control terminal blocks to accept conductors as shown on the electrical plan.

C. Options; the following options are required as scheduled on Plans:
1. Overcurrent Protection
   a. Automatic Circuit Breakers (in lieu of fuses)
2. Over-temperature Protection
   a. Manual Reset Thermal Cutout in control circuit in series with automatic
3. Switching Devices And Controls
   a. SCR (solid state modulating control)
   b. Fan relay (instead of airflow switch)
   c. Mercury Contactors (sealed for quiet switching); Disconnecting Break
   d. Time Delay Relay

D. Manufacturer to provide two year limited warranty for heating elements; other components and accessories to be warranted for one year.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
2. Arrange supports to avoid piercing drain pans.
3. Provide airtight seal between coil and duct or casing.

C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

D. Install coils level.

E. Make connections to coils with unions and flanges.

F. Electric Duct Heaters: Wire in accordance with NFPA 70.

3.2 SYSTEM STARTUP

A. Provide the services of manufacturer's field representative for starting and testing unit.

B. Prepare a manufacturer’s startup report and turn over to the Owner and Commissioning Agent.

END OF SECTION

SECTION 26 05 00

COMMON WORK FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, Division 26, Division 27, and Division 28.

1.2 GENERAL REQUIREMENTS

A. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Section. Where a specific section includes more stringent requirements than noted in this section, the more stringent requirements shall be applied and followed.

B. Provisions within the Specifications and Drawings describe minimum guidelines for electrical installations.

C. All electrical installations shall comply with the code requirements of NFPA 70 (NEC), NFPA 72, NFPA 90, WAC/RCW, Americans with Disabilities Act (ADA) and all local codes and ordinances.

D. Where industry standard design practices are published for use by design professionals, such guidelines shall be used as a minimum basis of design; e.g., IESNA Recommended Practices, BICSI Communication Distribution Standards, ANSI/TIA/EIA Standards and IEEE Publications.

E. Electrical efficiency, life-cycle cost and maintainability of proposed systems shall be considered prior to product selection.

F. Availability (lead times) and potential obsolescence shall be considered during product selection. Potential long-lead items shall be reviewed with the Owner's Representative.

G. Specified items that are essential to a facility's functional use shall have locally available spare parts and service and not be at risk to be discontinued by the manufacturer for a minimum of 5 years.

H. All low-voltage cables shall be labeled with computer printed, sleeve type, wire markers. The designation on the wire markers shall match those on the shop drawings.

I. The Owner shall be instructed on the operation of all systems at substantial completion and again three months after the initial instruction period.

1.3 SUMMARY

A. Provide supervision, labor, materials, tools, equipment/machinery, temporary power and lighting, and other services necessary to complete the work for complete operations described herein and as shown on the Drawings.

B. The provisions and intent of the General Conditions, Special Conditions, and General Requirements apply to the work as if specified in this Section and other Sections of the Specifications. Provide the electrical work as indicated or

specified in other Sections of the Specifications and Drawings of the Contract Documents.

C. Execute electrical work in strict accordance with the latest edition of the National Electrical Code and governing local ordinances, codes, and regulations. Assure the strict conformity of electrical equipment, materials, construction methods, tests, and definitions with the established standards of the following in their latest adopted revision: Underwriter's Laboratories, Inc. (UL), and National Electrical Manufacturers Association (NEMA).

D. Furnish and install all equipment in the Contract in harmony with other trades to provide completed systems with neat, finished appearance, using approved methods of the trade. Only good workmanship will be accepted. If, in the judgment of the Owner's Representative, any portion of work not installed in a workmanlike manner or left in a rough, unfinished condition, remove the equipment, reinstall same, patch and paint surrounding surfaces satisfactory to the Owner's Representative, with no increase in cost.

E. Mounting details of equipment, devices, light fixtures, raceways, junction boxes and the like are not usually shown or specified. Provide per industry standard practice and code requirements as necessary for proper installation and operation the same as if herein specified or shown.

F. Provide installation means and methods of all equipment, devices, light fixtures, raceways, junction boxes and the like per industry standard practice and code requirements as necessary for proper configuration and operation as if herein specified or shown.

G. Execute electrical work in strict conformance with the latest edition of the National Electrical Code, NFPA, IBC, IFC, Seattle Electrical Code, Seattle Energy Code, and governing local ordinances, codes, and regulations. Assure the strict conformity of Electrical equipment, materials, construction methods, tests, and definitions with the established standards of the following in their latest adopted revision: UL and NEMA.

H. All installations shall comply with ADA requirements.

I. Purchase permits, licenses, and approvals required for execution of the Work.

J. Test the entire electrical installation to assure compliance with Codes and proper system operation.

K. Electrical systems commissioning consists of static checks of component and system installations and actual testing of equipment conditions and functions.

L. The Commissioning Authority shall review and approve, prior to use, all test procedures and forms used and shall witness a varying fraction of the checks and testing performed by the Contractor. The Commissioning Authority shall review the completed check and test documentation of the Contactor for all checks and tests.

1.4 CALCULATIONS AND LABELLING

A. Provide complete Arc-Flash Hazards Calculation Report and label all equipment required per NFPA 70E to properly identify arc-flash hazards. Contractor is required to pay for and submit Arc-Flash Hazards Calculation to Owner's Representative and Engineer for review and approval prior to commencing work.

B. Provide complete Overcurrent Protective Device Coordination Study Report and install all devices per settings contained in the Coordination Study Report. Contractor is required to pay for and submit Coordination Study Report to Owner's Representative and Engineer for review and approval prior to commencing work.

1.5 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 70 – National Electrical Code.
   2. NFPA 70E – Standard for Electrical Safety in the Workplace.

B. International Code Council:
   1. IBC – International Building Code.
   2. IFC – International Fire Code.

C. National Electrical Manufacturers Association (NEMA).

D. Underwriters Laboratories (UL).

1.6 DEFINITIONS

A. The terms "or other reviewed and approved Manufacturers", "or approved equal" and "or equal" means final approval by the Architect or Engineer of a material or piece of equipment substituted for that which is shown in the Contract Documents.

B. The word "provide" as used in these Specifications or on the Drawings shall mean "furnish, install, and complete connection per factory instructions".

C. The term Mechanical Contractor (M.C.) and Electrical Contractor (E.C.) as used in these Specifications or on the Contract Drawings, refer to those subcontractors working under the direction of the General Contractor (G.C.).

D. The term "Engineer" shall refer to the licensed professional electrical engineer who is responsible for the preparation of the electrical documents.

1.7 EQUIPMENT

A. All materials shall be UL listed and labeled.

B. The interior of all electrical equipment shall be thoroughly cleaned prior to final acceptance.

C. All equipment and receptacles shall have permanent panel name and circuit number on equipment, disconnects, coverplates, etc.

1.8 SUBMITTALS

A. Approval Submittals:
   1. Statement of Manufacturer's Qualifications.
   2. Statement of Installer's Qualifications.
   3. Product Data: Submit and clearly identify product data, selection, and options.
   4. Shop Drawings: Submit all required shop drawings. Where product data and shop drawings are required for the work, submit both at the same time.

B. Shop Drawings:

1. Shop drawings produced in AutoCAD shall be provided for each low-voltage system (data, fire alarm, security, etc.) and specialty systems (lighting controls, etc.). Shop drawings shall show all device-to-device wiring. All as-builts shall be delivered in electronic format.
2. Shop drawings shall be based on the final room numbers established by the Owner or Architect; not the room numbers shown on the Architectural Floor Plans.
3. Provide as-built shop drawings for all systems. As-builts shall show the locations of all components, conduit runs and cables utilized.

C. Quality Assurance Submittals:
1. Test and Inspection Results.

D. Closeout Submittals:
1. Operations and Maintenance Manual Content.
2. Spare Parts and Materials.

E. Substitutions:
1. Conform to Division 01.
2. The naming of a certain brand or make or manufacturer in the Specifications is to establish a quality standard for the article desired. The Contractor is not restricted to the use of the specific name brand or manufacturer unless so specified as “no substitution”. However, substitution request is required and permitted only as specified in Division 01.
3. The Contractor shall assume full financial responsibility for any and all additional expenses arising from the use of a substitute product.

1.9 QUALITY ASSURANCE

A. General: These Specifications and Drawings are intended to cover a completed installation of systems. The omission of expressed reference to any items of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such labor and materials. Refer to the Drawings and Shop Drawings or other trades for additional details, which affect the proper installation of this work.

B. Conform to requirements of NFPA 70.

C. Conform to the latest edition of the NECA Standards for good workmanship in the electrical construction manual.

D. Provide all equipment included and as necessary and in harmony with other trades to provide completed systems with neat, finished appearance, using approved methods of the trade. Only good workmanship will be accepted. If, in the judgment of the Owner’s Representative, any portion of the work has not been installed in a workmanlike manner or left in a rough, unfinished condition, remove the equipment, reinstall same, patch and paint surrounding surfaces satisfactory to the Owner’s Representative, with no increase in cost to the Owner.

E. A Certified Testing Company shall perform the work of this Section and shall be qualified to test electrical equipment and is a NETA (National Electrical Testing Association) certified testing agency. The Certified Testing Company shall not be associated with the manufacturer(s) of the equipment or systems under test.

F. The Contractor shall provide all test equipment necessary to fulfill the checks and testing requirements. Test equipment shall have been calibrated within one (1) year of its use on this Project.

G. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer.

1.10 COORDINATION

A. Coordinate features of distribution equipment and power monitoring and control components to form an integrated interconnection of compatible components.
   1. Match components and interconnections for optimum performance of specified functions.

B. Coordinate Work of this Section with those in Section specifying distribution components that are monitored or controlled by power monitoring and control equipment.

1.11 CLOSEOUT DOCUMENTS

A. Conform to Division 01.

B. As-Built Drawings: Maintain a set of full-size Contract Plans at the site on which all changes and “as-built” modifications are recorded. All marks shall be in red pencil in a legible, neat manner. These drawings shall be reviewed monthly prior to final approval of pay request. Upon completion of the Project, the Contractor shall submit these drawings for final approvals.

C. Provide Operation and Maintenance Manuals in accordance with Division 01.
   1. Provide one preliminary bound set of Operation and Maintenance Manuals including maintenance information and parts list furnished by the manufacturer with the equipment, together with supplementary drawings where necessary to itemize serving and maintenance points. Include periodic maintenance, methods of operation, seasonal requirements, manufacturer’s data and warranty forms. Provide address and 24-hour phone number of firm responsible under warranty. Items requiring service or correction during the warranty period shall be serviced within 24-hours of notification by the Owner. Data in manuals shall be neat, clean copies, and posted on 8-1/2” x 11” sheets, typed, operation and maintenance instructions for each item of equipment installed. Drawings shall be accordion folded. An index shall be provided with all contents listed in an orderly presentation according to Specification Section.
   2. Number of Copies: The preliminary set of the O&M Manual shall be presented to the Owner’s Representative for review of content. After this set has been reviewed and accepted, two or as indicated in Division 01, additional copies shall be provided.
   3. Binding: Binders shall be as specified in accordance with Division 01, or if not specified in Division 01, binders shall be single touch, locking, D-Ring Type. Covers shall be black printed with the name of the job, the Owner, Architect, Engineer, Contractor, and the year of completion. The back edge shall be imprinted with the name of the job, the Owner, and the year of completion. Each copy shall have typewritten index and tabbed dividers between equipment categories. Binder shall have sufficient capacity to contain all data sheets and not exceed 3/4 of fill capacity.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Schedule materials, equipment, and light fixture deliveries and make all arrangements as necessary to complete all work in accordance with the project construction schedules. Provide schedules of work to the Owner's Representative as directed during construction.

B. Schedule deliveries and unloading to prevent traffic congestion, blocking of access, and interference with work. Arrange deliveries to avoid larger accumulations than can be suitably stored at site. Provide for continuity of supply to avoid change of supplier or change in brand of materials during any phase of work.

C. Deliver packaged materials to site in manufacturer's original, unopened, labeled containers. Do not open containers until approximate time for use. Store materials at locations that will not interfere with progress of work. Arrange locations of storage areas in approximately order of intended use.

D. Store materials in a manner that will prevent damage to materials or structure, and that will prevent injury to persons. Store cementitious materials in dry, weathertight, ventilated spaces. Store ferrous materials to prevent contact with ground and to avoid rusting and damage from weather.

E. Provide documentation to the Owner's Representative for any claim of material, equipment and light fixture deliveries not able to meet construction schedules.

1.13 PROJECT CONDITIONS

A. Field verify and examine existing conditions.

B. Verify requirements for temporary electrical power and construction power.

C. Verify requirements for permanent power and telecommunication service requirements.

D. Identify existing conditions and requirements for cutting, patching, excavation, core drilling, etc.

E. Include all costs to provide the electrical installation associated with the existing conditions for the best workmanship and operation according to the intent of the Specifications and Drawings.

F. Report to the Owner's Representative any condition that might prevent the installation of the equipment in the manner intended.

PART 2 – PRODUCTS

2.1 GENERAL

A. Naming of manufacturers indicates the manufacturer's brand name is acceptable only if their product is in compliance with each and every provision of this Specification. Failure to comply will result in disapproval.

B. Supplier and/or Electrical Contractor shall be responsible to ensure that material or equipment is of the same size, quality, capacity, weight, and electrical characteristics as that specified. The Contractor/Supplier shall pay any changes and costs required during construction due to Contractors/Suppliers neglect to properly select equipment.

C. Notify Owner's Representative for an on-site visit to inspect material and equipment prior to installation.

D. Materials and equipment shall be new, undamaged, and shall be UL listed for its use.

E. Defects and damages of material shall be replaced, furnish any new material as necessary and install the system at the Contractor's expense.

F. Furnish material and equipment samples when requested by the Owner's Representative, within 21-days of request.

G. Non-approved material and equipment must be removed from the jobsite.

PART 3 – EXECUTION

3.1 EXAMINITION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting the performance of the Work.

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

3.2 GENERAL

A. Conform to Division 01.

B. Provide conduit, wiring, and all components indicated on schedules and diagrams.

C. Before any installation, devices or equipment can be directed or located by the Owner's Representative within 20-feet of the designed contract location without extra cost.

D. Device or equipment mounting height given herein the Specifications, Contract Drawings, and/or documents are intended to provide general guidelines pursuant to industry standards. Such guidelines may not be exact or accurate and may or may not conflict with other trades installation without verification.

E. Provide field coordination and verification with other contractors, trades, or any shop drawings, and ensure that such mounting heights if indeed are practical and feasible as not to conflict with other installation and construction. If conflicts are discovered at any time during the construction, report to the Owner's Representative immediately for resolution.

F. If the Contractor fails to provide such coordination and field verification and results of erroneous installation, the Contractor shall remedy such installation per Owner's Representative direction, at Contractor's cost.

3.3 MANUFACTURER'S DIRECTIONS

A. Apply, install, connect, and erect manufactured items or materials according to the recommendations, wiring diagrams, instructions of the manufacturer when such recommendations are not illustrated or in conflict with the Contract Documents.

B. Furnish to the Owner's Representative on request, copies of manufacturer's recommendations. Secure approval of recommendations before proceeding with work.

C. Keep at the site not less than one copy, in good condition, of manufacturer's recommendations, wiring diagrams, instructions, or directions, pertaining to work at the site. Inform involved personnel of requirements and availability of manufacturer's recommendations.

3.4 UTILITY STANDARDS

A. All work associated with electrical power and telecommunications utilities shall be installed in accordance with the standards and specifications established by the serving utility.

B. Contact electrical power and telecommunications utilities. Verify and coordinate work scope prior to commencement of installation.

3.5 COORDINATION

A. The drawings are diagrammatic and indicate generally the locations of materials and equipment. These drawings shall be followed as closely as possible. Coordinate the work under this section with the architectural, structure, plumbing, heating and air conditioning, and the drawings of other trades for exact dimensions, clearances, and roughing-in locations. Cooperate with other trades in order to make minor field adjustments to accommodate the work of others.

B. Coordinate work with Ceiling Contractor so that above-ceiling work is completed, inspected and accepted by the Owner's Representative prior to ceiling installation.

C. Verify counter heights with cabinet installer and cabinet shop drawings, prior to rough-in for outlets. Unless otherwise indicated, outlets are to be mounted 6" (on center) above counter or backsplash. Existing outlets to be extended to match new outlet installation height. Verify height with Owner's Representative of any location that will not accommodate mounting heights.

D. Coordinate electrical work with mechanical installations. Connect power wiring to mechanical equipment through starters, contactors as required. Maintain clearances around mechanical equipment to allow access for maintenance per NEC codes and local codes.

E. Coordinate wiring interconnections for the complete operation of electrical-mechanical equipment to include items provided by other divisions. Examine equipment connection information with manufacturer's shop drawings and submittals.

F. Provide detailed wiring diagrams for equipment and component interconnection when requested by the Owner's Representative.

G. Verify with Mechanical Contractor for final mechanical equipment locations prior to work. Connect power wiring to mechanical equipment through starters, contactors, and VFDs as required.

H. Refer to project Construction Schedules. Schedule each specific area so that the delivery of materials and equipment are such as to cause no delay in Construction Schedules. Include the premium cost of delivery of equipment and overtime work in order to comply with the Construction Schedule if necessary.

I. Coordinate and verify exact locations of wiring devices, light fixtures, fire alarm and communication devices and equipment prior to beginning of rough-in.

J. If directed by the Owner's Representative, the Contractor shall, without extra charge, verify with local inspectors or authorities having jurisdiction, and make reasonable modifications in the layout as needed to prevent conflict with work of other trades of for proper execution of the work.

K. If directed by the Owner's Representative, the Contractor shall, without extra charge, provide layouts of equipment and details of mounting method for review, prior to installation to ensure proper execution of the work.

3.6 RACEWAYS

A. One-line diagrams, risers, and conduit routing are schematic and are not showing exact physical arrangement of equipment or exact routing of conduit. Coordinate conduit routing with all other trades.

B. Where indicated on Drawings, junction boxes and pull boxes are minimum requirements. Provide other fittings and pull boxes of adequate size in the raceway system wherever necessary or required by the National Electrical Code. Allow a maximum of four-quarter bends between pull boxes in each run of conduits.

C. Provide expansion joint fittings for conduits passing through new or existing expansion joints installed between buildings. Verify exact locations and details of expansion joints prior to work.

D. Coordinate conduit routing, pull box and equipment locations with other trades to avoid conflicts of equipment installations.

E. All empty conduits shall have pull wires.

F. Provide unistrut mounting channels, hanger rods, anchor bolts and fittings to support conduits and pull boxes.

G. Work shall comply with National Electrical Code requirements.

3.7 MISCELLANEOUS

A. Support all conduits and equipment in accordance with the National Electrical Code and the International Building Code.

B. Cutting and Patching: Perform cutting and patching as may be necessary for the proper installation of the electrical work. Grout around raceway penetrations and fill anchor bolt holes or spalled areas. Core drill new penetrations through existing structural walls, ceilings, and floor slabs.

C. Cleanup: The premises must be kept free of accumulated materials, rubbish, and debris at all times. Surplus materials, tools, and equipment must not be stored at the building. At the completion of the job, equipment and fixtures shall be left clean and in proper condition for their intended use.

D. Trenching: Perform excavation and backfill as may be necessary for the proper installation of the Electrical work, unless noted otherwise on the Drawings.

E. Demolition: Electrical demolition shall be performed by the Electrical Contractor as indicated on Plans and other sections of the Contract Documents.

F. Installation Details: Prepare and submit to the Owner's Representative detail sketches indicating equipment installation information with locations and dimensions.

G. Tests: Test wiring and electrical equipment to verify absence of grounds and short circuits and verify proper operation, rotation, and phase relationship. Demonstrate operation of all equipment in accordance with the requirements of this Specification and the manufacturer's recommendations. Perform tests in the presence of the Owner's Representative. Provide instruments and personnel required to conduct these tests.

3.8 DRAFT STOPS AND FIRE STOPS

A. Verify with Architectural Plans and to maintain the integrity of the draft stops whenever work requires penetration of these areas. Patch as required to maintain integrity of stops.

B. Maintain fire-resistance ratings of walls, partitions, floors, ceiling, or other fire separation barriers whenever work requires penetrations or openings for equipment. Provide and use approved methods and fire seal material and fitting to maintain the fire resistance rating. Provide approved fire rated enclosures of double gypsum wall board for electrical panels installed in fire rated walls to maintain the wall fire resistance rating. Where panels are semi-flush mounted, provide painted oak wood trim.

C. Locate devices horizontally a minimum of 2-feet apart on opposing sides of a fire separation wall to maintain fire rating of wall.

3.9 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

A. Scope: Following installation of work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner's Representatives.

B. General Description of Instruction Periods: Each period shall include preliminary discussion, and presentation of information from maintenance manuals with appropriate references to Drawings; followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, and equipment cleaning procedures, control settings and available adjustments.

C. Scheduling of Instruction Periods: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given to Owner's Representative at least two (2) weeks prior to the instruction periods, and agreement reached as to the date at which the instruction periods are to be performed. Obtain approvals of proposed date prior to making final arrangements.

3.10 GENERAL ELECTRICAL CHECKS AND TESTING

A. Test wiring and electrical equipment to verify absence of grounds and short circuits and verify proper operation, rotation, and phase relationship. Upon request, demonstrate operation of all equipment in accordance with the requirements of this Specification and the manufacturer's recommendations. Provide instruments and personnel required to conduct these tests.

B. Checks are intended to begin upon completion of a component or equipment installation. Testing generally occurs later when systems are energized or nearing that point. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system as soon as possible, including all construction checklists and may require retesting portions of the system once all components are fully functioning.

C. The check and test procedures and record forms shall contain the following:
1. The Subcontractor(s) executing checks or tests.
2. A list of the integral components being inspected and tested, equipment tag numbers, manufacturer, model number, pertinent performance information / rating data.
3. Test equipment used.
4. Construction checklists associated with the components, if any.
5. Any special required conditions of the check or test for each procedure.
6. Items, conditions or functions to be inspected, verified or tested, the checks and testing method given and a place provided with results recorded.
7. Acceptance criteria (or reference by specific table where the acceptance criteria is found).
8. For each procedure, list the technician performing check or test and company, witnesses of the tests and dates of tests.
9. Sampling strategies used.

D. The test procedures for dynamic equipment like lighting controls, emergency generator or fire alarm shall contain more step-by-step procedures. The test procedures and forms for more static components like panelboards, switchgear, circuit breakers, transformers, etc., can be more checklist-like in format. For each piece of equipment, checks and test procedures and their documentation record forms may be different documents or combined in the same document, but checks and tests should be grouped.

E. At the Commissioning Authority’s discretion, if large numbers or repeated deficiencies are encountered, the Contractor shall test and troubleshoot all remaining systems at issue on their own before commissioning with the Commissioning Authority will resume.

F. Sampling for Identical Units. When there are a number of identical units, at the Commissioning Authority’s discretion, some or all procedures of a test for a piece of equipment or assembly may be omitted when these same tests on other pieces of identical equipment or assemblies were conducted without deficiency.

G. Common Testing Requirements:
1. The following requirements apply to all electrical systems and features that are to be commissioned when referenced below. Tests shall:
a. Verify functionality and compliance with the design intent for each individual sequence module in the sequences of operation. Verify proper operation of all control strategies, energy efficiency and self-diagnostics features by stepping through each sequence and documenting equipment and system performance. Test every step in every written sequence and other significant modes, sequences and operational features not mentioned in written sequences; including startup, normal operation, shutdown, scheduled on and

off, unoccupied and manual modes, safeties, alarms, overrides, lockouts, and power failures.

b. Verify all alarm and high and low limit functions and messages generated on all points with alarm settings.

c. Verify integrated performance of all components and control system components, including all interlocks and interactions with other equipment and systems.

d. Verify shutdown and restart capabilities both for scheduled and unscheduled events (e.g. power failure recovery and normal scheduled start/stop).

e. When applicable, demonstrate a full cycle from off to on and no load to full load and then to no load and off.

f. Verify time of day schedules and setpoints.

g. Verify all energy saving control strategies.

h. Verify that monitoring system graphics are representative of the systems and that all points and control elements are in the same location on the graphic as they are in the field.

i. Verify operator control of all control system points including proper security level access.

j. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems the NETA test procedures shall be part of the testing requirements of this specification. Additional testing procedures may be listed in this Specification.

H. Common Acceptance Criteria:

1. The following common acceptance criteria apply to all equipment, assemblies, and features:

a. For the conditions, sequences and modes tested, the equipment, integral components and related equipment shall respond to varying loads and changing conditions and parameters appropriately as expected, according to the sequences of operation, as specified, according to acceptable operating practice and the manufacturer’s performance specifications. Verify that equipment operates within tolerances specified in: governing codes, acceptance criteria contained in the construction documents, manufacturer’s literature and according to good operating practice.

b. Systems shall accomplish their intended function and performance.

c. All safety trips shall require a manual reset to allow a system restart.

d. Resetting a manual safety shall result in a stable, safe, and predictable return to normal operation by the system.

e. Safety circuits and permissive control circuits shall function in all possible combinations of selector switch positions (hand, auto, inverter, bypass, etc.).

f. Other acceptance criteria is given in the equipment testing requirements articles or referenced standards.

g. Additional acceptance criteria will be developed by the Commissioning Authority when detailed test procedures are developed.
h. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems the NETA performance criteria shall apply.

I. Load Balancing:
1. Checks shall be made for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.
2. Record all circuit changes on as-built drawings.
3. Do not fabricate nameplates, or cover plate device labeling prior to load balance test and adjustments.

3.11 COMMISSIONING REQUIREMENTS

A. The equipment and systems referenced in this Section are to be commissioned per Section 01 91 00 “Commissioning” and per Section 26 08 00 “Commissioning of Electrical Systems”. The Contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

SECTION 26 05 19

LOW–VOLTAGE ELECTRIAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Copper building wire rated 600 V or less.
   2. Aluminum building wire rated 600 V or less.
   3. Metal-clad cable, Type MC, rated 600 V or less.
   4. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

B. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer's authorized service representative.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Testing Agency Qualifications: Member company of NETA.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Service Wire Co. or a comparable product by one of the following:
   1. Alpha Wire Company.
   2. American Bare Conductor.
   3. Belden Inc.

4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company.
8. Southwire Company.
9. WESCO.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:
1. Type NM: Comply with UL 83 and UL 719.
2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type THHN and Type THWN-2: Comply with UL 83.
5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
6. Type UF: Comply with UL 83 and UL 493.
7. Type XHHW-2: Comply with UL 44.

2.2 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Service Wire Co. or a comparable product by one of the following:
1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company.
8. Southwire Company.
9. WESCO.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Conductor Insulation:
1. Type NM: Comply with UL 83 and UL 719.

2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type THHN and Type THWN-2: Comply with UL 83.
5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
6. Type XHHW-2: Comply with UL 44.

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Service Wire Co. or a comparable product by one of the following:
1. AFC Cable Systems; a part of Atkore International.
2. Alpha Wire Company.
3. American Bare Conductor.
4. Belden Inc.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company.
8. Southwire Company.
9. WESCO.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:
1. Single circuit and multi-circuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:
1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel, interlocked.

I. Jacket: PVC applied over armor.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Basis-of-Design Product: Subject to compliance requirements, provide Service Wire Co. or a comparable product by one of the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. ILSCO.
7. NSi Industries LLC.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. TE Connectivity Ltd.
10. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper.
2. Type: One hole with standard barrel.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders and Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

C. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders and Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Feeders and Branch Circuits in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

G. VFC Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. 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.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

G. Complete cable tray systems installation prior to installing conductors and cables.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer’s written requirements. Provide documentation of the torque connections to engineer for closeout documentation. If values do not match manufacturer recommendation, contractor to provide additional torquing and provide documentation that the requirements have been adhered to. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 00 "Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conduc-

tors feeding equipment and services as deemed critical by the Owner's Representative

2. Perform each of the following visual and electrical tests:
   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:
      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.
   c. Inspect compression-applied connectors for correct cable match and indentation.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.
   f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
   g. Continuity test on each conductor and cable.
   h. Uniform resistance of parallel conductors.
3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
4. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide a complete grounding system that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

B. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and testing agency's field supervisor.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Cooper Power Systems.

B. Storm Copper Components Co.

C. Harger.

D. Or other reviewed and approved Manufacturers.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-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. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

L. Straps: Solid copper, copper lugs. Rated for 600 A.

M. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

N. Water Pipe Clamps:
   1. Mechanical type, two pieces with stainless-steel bolts.
      a. Material: Tin-plated aluminum or Die-cast zinc alloy.
      b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned copper conductor, No. 2/0 AWG minimum.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment.
1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so minimum 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 FENCE GROUNDING

A. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:
   1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
      a. Gates and Other Fence Openings: Ground fence on each side of opening.
         1) Bond metal gates to gate posts.
         2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

F. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. Use exothermic welds for all below-grade connections.
   3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole shall be at least 12 inches deep, with cover.
   1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

K. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
   4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
   5. Substations and Pad-Mounted Equipment: 5 ohms.
   6. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.
1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.
1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Ductwork, piping, fittings, and supports.
   3. Structural members to which hangers and supports will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Items penetrating finished ceiling, including the following:
      a. Luminaires.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M.
   2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
   2. Component Importance Factor: 1.5.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame Rating: Class 1.
   2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c. in at least one surface.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Gripple, Inc., pipe support and hanging systems, or comparable products by one of the following:
      a. Allied Tube & Conduit; a part of Atkore International.
      b. B-line, an Eaton business.
      c. ERICO International Corporation.
      d. Flex-Strut Inc.
      e. GS Metals Corp.
      f. G-Strut.
      g. Haydon Corporation.
      h. Metal Ties Innovation.
      i. Thomas & Betts Corporation; A Member of the ABB Group.
      j. Unistrut; Part of Atkore International
      k. Wesanco, Inc.
   2. Pipe Bracket Kit Description: Pipe Bracket (PB1FT / PB2FT / PB3FT / PB4FT) and Universal (GC2-T) clamps or Compact (GC2-C) clamps. Manually assembled in the field to support multiple parallel pipes.
   3. Approvals: ISO 17025, MSS-SP 58, IAPMO/ANSI UPC 1-2012, UL 2239, and UL 2043.
   4. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   5. Material for Channel, Fittings, and Accessories: Galvanized steel.
   6. Channel Width: Selected for applicable load criteria. Default is 1-5/8 inches.
   7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c. in at least one surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper Industries, Inc.
      b. Flex-Strut Inc.
      c. Haydon Corporation
      d. MKT Metal Manufacturing
      e. Thomas & Betts Corporation; A Member of the ABB Group.
      f. Unistrut; Part of Atkore International.
   2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   3. Channel Material: 6063-T5 aluminum alloy.
   4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
   5. Channel Width: Selected for applicable load criteria. Default is 1-5/8 inches.

6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c., in at least one surface.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. B-line, an Eaton Business.
   c. Fabco Plastics Wholesale Limited.
   d. G-Strut.
   e. Haydon Corporation.
   f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channel Width: Selected for applicable load criteria. Default is 1-5/8 inches.
4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
6. Rated Strength: Selected to suit applicable load criteria.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti, Inc.
      2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete, with tension,

shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1) B-line, an Eaton business.
   2) Empire Tool and Manufacturing Co., Inc.
   3) Hilti, Inc.
   4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
   5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA 101
   3. NECA 102.
   4. NECA 105.
   5. NECA 111.

B. Comply with requirements in Section 07 84 00 " Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
   6. To Light Steel: Sheet metal screws.
   7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 09 90 00 "Painting and Coating" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings.
   2. Nonmetallic conduits and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Nonmetal wireways and auxiliary gutters.
   5. Surface raceways.
   6. Boxes, enclosures, and cabinets.
   7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Section 07 84 00" Firestopping" for firestopping at conduit and box entrances.
   2. Section 27 05 28 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Samples: For wireways, nonmetallic wireways, and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. FSR Inc.
6. O-Z/Gedney; and EGS Electrical Group brand.
7. Patriot Aluminum Products, LLC.
8. Picoma Industries.
9. Republic Conduit.
10. Robroy Industries.
11. Southwire Company.
12. Thomas & Betts Corporation, A Member of the ABB Group.
13. Western Tube and Conduit Corporation.
14. Wheatland Tube Company.

B. Metal Conduit:
1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. ARC: Comply with ANSI C80.5 and UL 6A.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   a. Comply with NEMA RN 1.
   b. Coating Thickness: 0.040 inch, minimum.
6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

C. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.

4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
   a. Material: Steel.
   b. Type: Compression.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

D. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX INC.
5. CertainTeed Corporation.
6. Condux International Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions.
10. Niedax Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation, A Member of the ABB Group.

B. Nonmetallic Conduit:
1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Fiberglass:
   a. Comply with NEMA TC 14.
   b. Comply with UL 2515 for aboveground raceways.
   c. Comply with UL 2420 for belowground raceways.
3. ENT: Comply with NEMA TC 13 and UL 1653.
4. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
5. LFNC: Comply with UL 1660.
6. Rigid HDPE: Comply with UL 651A.
7. Continuous HDPE: Comply with UL 651A.
8. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
9. RTRC: Comply with UL 2515A and NEMA TC 14.

C. Nonmetallic Fittings:
1. Fittings, General: Listed and labeled for type of conduit, location, and use.

2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
   a. Fittings for LFNC: Comply with UL 514B.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum installation unless otherwise indicated.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. MonoSystems, Inc.
4. Square D.
5. Wiegmann; division of Hubbell Incorporated.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type, unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allied Moulded Products, Inc.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Lamson & Sessions.
4. Niedax Inc.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.6 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell incorporated; HBL6750 or comparable product by one of the following:
      a. MonoSystems, Inc.
      b. Panduit Corp.
      c. Wiremold/Legrand.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell incorporated; PB3 or a comparable product by one of the following:
      a. MonoSystems, Inc.
      b. Panduit Corp.
      c. Wiremold / Legrand.

D. Tele-Power Poles:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; HBLPP Series or a comparable product by one of the following:
      a. MonoSystems, Inc.
      b. Panduit Corp.
      c. Wiremold / Legrand.
   2. Material: Galvanized steel with ivory baked-enamel finish.
   3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; steel boxes or comparable product by one of the following:
   1. Adalet.
   2. Cooper Technologies Company.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.
   5. FSR Inc.
   6. Hoffman; a brand of Pentair Equipment Protection.
   7. Kraloy.
   8. Milbank Manufacturing Co.
   9. MonoSystems, Inc.
   10. Oldcastle Enclosure Solutions.
   11. O-Z/Gedney; an EGS Electrical Group brand.
   12. RACO; Hubbell.

13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation, A Member of the ABB Group.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; B series or a comparable product by one of the following:
   a. FSR, Inc.
   b. Thomas & Betts Corporation, A Member of the ABB Group.
   c. Wiremold / Legrand.
2. Material: Cast metal or sheet metal.
3. Type: Fully adjustable.
4. Shape: Rectangular.
5. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; PFBRG3 rectangular floor box or a comparable product by one of the following:
   a. FSR, Inc.
   b. Thomas & Betts Corporation, A Member of the ABB Group.
   c. Wiremold / Legrand.
2. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

N. Gangable boxes are allowed.

O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic or Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

P. Cabinets:
1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Oldcastle Precast, Inc.
b. Armorcast Products Company.
c. Carson Industries LLC.
d. NewBasis.
e. Quazite: Hubbell Power Systems, Inc.
f. Synertech Moulded Products.
2. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
3. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Precast-Concrete Handholes and Boxes
1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
2. Comply with ASTM C 858 for design and manufacturing processes.
3. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC" or “SYSTEMS”.

6. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
7. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
   a. Extension shall provide increased depth of 12 inches.
   b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
8. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
9. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
   a. Type and size shall match fittings to duct to be terminated.
   b. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
10. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover:
1. Description: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC" or “SYSTEMS”.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

D. Fiberglass Handholes and Boxes:
1. Description: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete fiberglass.
2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Gray.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC" or “SYSTEMS”.
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.9 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC.
   3. Underground Conduit: RNC, Type EPC-40-PVC. Concrete encased under roadways, streets, areas subject to vehicular traffic and as required by local utility.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
      d. Gymnasiums.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: GRC.
   7. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway, Plenum-type, communications-cable pathway or EMT.
   8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: Plenum-type, optical-fiber-cable pathway, or Plenum-type, communications-cable pathway, or EMT.

9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1-1/4” for telecommunications data cabling, 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Pathways for low-voltage electrical conductors:
1. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

I. Pathways for Optical-Fiber and Communications Cables: Install pathways metal and nonmetallic, rigid and flexible, as follows:

1. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

J. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

K. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

L. Support conduit within 12 inches of enclosures to which attached.

M. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Owner’s Representative for each specific location.
5. Change from ENT to GRC before rising above floor.

N. Stub-Ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at

each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

X. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Z. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

AA. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

BB. Mount boxes at heights indicated on Electrical and Architectural Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

CC. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

DD. Locate boxes so that cover or plate will not span different building finishes.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Preparation
1. Coordinate layout and installation of duct, duct bank, manholes, handholes, vaults, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
2. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, vaults, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes, vaults, and handholes, and as approved by Architect.
3. Clear and grub vegetation to be removed, and protect vegetation to remain. Remove and stockpile topsoil for reapplication.

B. Earthwork
1. Excavation and Backfill:
a. Place and compact backfill in excavations promptly, but not before completing the following:
1) Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.

2) Surveying locations of underground utilities for Record Documents.
3) Testing and inspecting underground utilities.
4) Removing concrete formwork.
5) Removing trash and debris.
6) Removing temporary shoring, bracing, and sheeting.
7) Installing permanent or temporary horizontal bracing on horizontally supported walls.

2. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.
3. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
4. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
5. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures.
6. Muck Excavation: Where much or unstable material is encountered, over excavate and backfill to attain proper grade with coarse sand, gravel, or controlled density fill.
7. Pile backfill material in an orderly manner; a sufficient distance from the trench to avoid overloading trench banks.
8. Bedding: The entire bottom of the excavation is to be firm, stable, and at uniform density.

C. Duct and Duct-Bank Installation:
1. Slope: Pitch duct a minimum slope of 1:300 down toward manholes, vaults, and handholes and away from buildings and equipment. Slope duct from a high point between two manholes or vaults, to drain in both directions.
2. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, 25 feet, both horizontally and vertically, at other locations unless otherwise indicated.
3. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
4. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct or duct bank from the steam line.
5. End Bell Entrances to Manholes, Vaults, and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
   a. Begin change from regular spacing to end-bell spacing 10 feet from the end bell, without reducing duct slope and without forming a trap in the line.

b. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole, vault, or handhole. Install an expansion fitting near the center of all straight line direct-buried duct with calculated expansion of more than 3/4 inch.
c. Grout end bells into structure walls from both sides to provide watertight entrances.

6. Terminator Entrances to Manholes, Vaults, and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
   a. Begin change from regular spacing to terminator spacing 10 feet from the terminator, without reducing duct line slope and without forming a trap in the line.
   b. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole, vault, or handhole. Install an expansion fitting near the center of all straight line duct with calculated expansion of more than 3/4 inch.
7. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
8. Pulling Cord: Install 200-lbf test nylon cord in empty ducts.
9. Direct-Buried Duct and Duct Bank:
   a. Excavate trench bottom to provide firm and uniform support for duct. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
      1) Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
         a) Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
   b. Width: Excavate trench 12 inches wider than duct on each side.
   c. Depth: Install top of duct at least 36 inches below finished grade unless otherwise indicated.
   d. Set elevation of bottom of duct bank below frost line.
   e. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
   f. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
   g. Install duct with a minimum of 3 inches between ducts for like services and 12 inches between power and communications duct.

h. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

i. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
   1) Couple RNC duct to GRC with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
   2) Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
      a) Stub-ups shall be minimum 4 inches above finished floor and minimum 3 inches from conduit side to edge of slab.

j. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
   1) Place minimum 3 inches of sand as a bed for duct. Place sand to a minimum of 6 inches above top level of duct.

10. Underground-Line Warning Tape: Bury warning tape no less than 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.4 INSTALLATION OF CONCRETE MANHOLES, VAULTS, HANDHOLES, AND BOXES

A. Precast Concrete Handhole, Manhole, and Vault Installation:
   1. Comply with ASTM C 891 unless otherwise indicated.
   2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
   3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Drainage: Install drains in bottom of manholes and vaults. Provide 2-feet minimum of gravel below the drain hole or provide a drain line to the nearest storm drain.

C. Dampproofing: Apply dampproofing to exterior surfaces of manholes, vaults, and handholes after concrete has cured at least three days. After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole and vault chimneys after mortar has cured at least three days.

D. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors.

E. Field-Installed Bolting Anchors in Manholes, Vaults, and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and vaults, and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth co-ordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth co-ordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size

holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.8 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.9 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.2 SUMMARY

A. Provide completely identified electrical systems and equipment that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

1.3 CALCULATIONS AND LABELLING

A. Provide complete Arc-Flash Hazards Calculation Report and label all equipment required per NFPA 70E to properly identify arc-flash hazards. Contractor is required to pay for and submit Arc-Flash Hazards Calculation to Owner's Representative and Engineer for review and approval prior to commencing work.

B. Provide complete Overcurrent Protective Device Coordination Study Report and install all devices per settings contained in Coordination Study Report. Contractor is required to pay for and submit Coordination Study Report to Owner's Representative and Engineer for review and approval prior to commencing work.

1.4 LABELLING GENERAL

A. Label each and every circuit breaker in the Main Switchboard(s) or Distribution Board(s) with a phenolic nameplate that identifies the load and location served.

B. Label all panelboards with a phenolic nameplate that also identifies the voltage, ampere rating, and source panel.

C. Provide a sign on the cover of each panelboard requiring a minimum of 36" or 42" of clear working space in front of the panel.

D. Label all transformers with a phenolic nameplate that identifies the source panel and the panel or load being served.

E. Label all disconnect switches and motor starters and permanently mounted electrical loads and control equipment with a phenolic nameplate that identifies the source panel and the load served.

1.5 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.

B. NFPA 70E – Standard for Electrical Safety in the Workplace.

C. ASTM International.

1.6 GENERAL REQUIREMENTS

A. Electrical and Communications Vaults shall be properly labeled per ID shown on the Drawings.

B. Underground conduits shall be properly labeled in vaults and in buildings where conduits stub up from below grade. Contractor shall be responsible for the ID names/numbers.

C. Electrical and Low-Voltage Equipment shall have placards with appropriate ID on front covers of equipment.

D. All interior conduit and junction boxes shall be labelled with panel name and circuit numbers of conductors routed via conduit and junction boxes.

E. Conductors shall be properly identified with both color coding and self-adhesive labels.

F. All equipment per NFPA 70E that requires arc-flash labelling shall be properly identified per NFPA 70E.

G. All overcurrent protective devices required to be selectively coordinated per NEC 700 and 701 shall be properly coordinated and device settings shall be included in panelboard and switchboard enclosures with the corresponding panel schedules.

1.7 SUBMITTALS

A. Product Data: Provide catalog data for nameplates, labels, and markers.

B. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Arc-Flash Hazards Calculation: Provide complete arc-flash hazards calculation per NFPA 70E to Owner’s Representative and Engineer for review and approval.

D. Overcurrent Protective Device Coordination Study: Provide complete coordination study per NEC 700 and 701 to Owner’s Representative and Engineer for review and approval.

E. Underground Conduit Ductbanks: Provide site plan with identification names/numbers of individual conduits, vaults, and handholes for Owner’s Representative and Engineer’s review and approval.

1.8 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories (UL) as suitable for purpose specified as shown.

B. Comply with NFPA 70 and NFPA 70E.

1.9 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications and with those required by codes and standards.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

PART 2 – PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Buried Electrical Lines: Underground warning tapes.

B. Communication Cabinets: Nameplates.

C. Conduit: Conduit Markers.

D. Electrical Distribution and Control Equipment Enclosures: Nameplates.

E. Transformers: Nameplates.

F. Junction Box Load Connections: Wire Markers.

G. Outlet Box Load Connections: Wire Markers.

H. Outlet Box Wall Cover Plates: Laser Etching.

I. Panel Gutter Load Connections: Wire Markers.

J. Pull Box Load Connections: Wire Markers.

K. Communication and Electrical Vaults: Nameplates.

2.2 NAMEPLATES AND LABELS

A. Manufacturers:
1. Marking Services, Inc. (MSI): http://www.markserv.com
2. Double O Laser Services, Inc.: http://www.doubleolaser.com
3. Or other reviewed and approved manufacturers.

B. Panelboard, Distribution Board, and Equipment Disconnect Nameplates: Engraved plastic, high contrast for maximum visibility. 1/16" engraving plastic with either mounting holes or adhesive backing.
1. Normal Power: White letters on black.
2. Emergency Power: Black letters on orange.
3. Panelboard and Distribution Board Labels:

Description:	Example:
Panel Name:	1M
Voltage:	480/277V
Amperes:	800A
Supplied From:	MSB-1

4. Equipment Disconnect Labels:

Description:	Example:
Equipment Name:	AHU-1
Voltage/Phase:	480V/3PH
Rated Load:	20HP
Supplied From:	PANEL 1M

C. Load Equipment Nameplates: Laser engraved black impression stainless steel with brushed satin finish & permanent black impression.
   1. 430 Alloy, .029 thick.
   2. 1/8” holes for attachment to equipment with stainless steel self-drilling screws.
   3. Letter Size:
      a. Load Equipment Name: use 0.375-inch letters.
      b. All others: use 0.25-inch letters.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches, receptacles, control device stations.

E. Warning/Safety Labels: Industry standard self-adhesive warning/safety labels. Provide industry standard labeling, code required and per AHJ.

2.3 DEVICE AND JUNCTION BOXES

A. Manufacturer pre-painted junction box cover plates:
   1. 480/277V Normal Power System: Yellow.
   2. 208/120V Normal Power System: Blue.
   3. Emergency Power System: Orange (painted inside and outside all other sides of box).
   4. Fire Alarm System: Red (painted inside and outside all other sides of box).

B. Identify power circuits contained within junction boxes using permanent black ink marker with Panel Name and Circuit Number on cover plate of junction box.

2.4 OUTLET BOX COVER PLATES

A. Laser etched with panel name and circuit number on stainless steel cover plates. Laser etching shall be by Marking Services, Inc. (MSI). Refer to the following for examples:

Panel Name – Circuit Number - 2X4A – 22

Panel Name – Circuit Numbers - 1M4A – 1,3,5

2.5 CONDUCTOR IDENTIFICATION

A. Manufacturers:
   1. Brady Corporation: Model (B-702).
   2. Or other reviewed and approved Manufacturers.

B. Description: Vinyl cloth type self-adhesive wire markers.

C. Color: Black on White.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.

E. Wire Color Coding:
   1. Single Phase, 3-Wire System: 120/240-Volt.
   2. Three Phase, 4-Wire System: 120/208-Volt.
   3. Three Phase, 4-Wire System: 277/480-Volt.
   4. Equipment Ground Wire: Green.
   5. Control wiring shall be black with identifying wire numbers at each termination.
   6. Color-coded tape may be used in lieu of color-coded insulation for conductors #8 AWG and larger. However, when color coded tape is used, the conductor insulation shall be black only and shall be tape identified with color scheme shown above at splices, terminations, and junction boxes.

2.6 RACEWAY IDENTIFICATION

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Provide conduit identification at both ends of all Medium Voltage Conduits, Low Voltage Conduits, and Communications Conduits identifying systems contained within conduits and “to” location for other end of conduit. This requirement applies to both site underground conduits routed between vaults, buildings, and also conduits within Buildings.

2.7 CONDUIT MARKERS

A. Location: Furnish markers for each conduit longer than 6-feet (2m).

B. Spacing: 20-feet (6m) on center.

C. Color:
   1. 480/277 Volt System: Yellow.
   2. 208/120 Volt System: Blue.
   3. Fire Alarm System: Red.
   4. Telecommunication System: Gray.

D. Underground Conduit Entering Vaults:
   1. Brass conduit tags.
   2. .032-inch (20 gauge) brass.
   3. 3/16-inch hole for easy mounting.
   4. Top line 1/4-inch text with second line 1/2-inch number is standard.
   5. Tag shall identify conduit by system and location of other end of conduit. E.g., “FIBER – RM K104”. Identify “SPARE” for system for empty conduits.

2.8 UNDERGROUND WARNING TAPE

A. Underground Warning Tape: 3-inches (76 mm) wide polyethylene tape, detectable type colored red with suitable warning label describing buried electrical lines.

B. Warning tape shall be acid and alkali-resistant and shall have a minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise, with an elongation factor of 350%.

2.9 WARNING/SAFETY LABELS

A. Self-adhesive, industry standard labels.

B. Provide labels per code requirements and per AHJ.

C. Provide the following label on front of all 208V or 240V Panelboards, Distribution Boards, and Switchboards:

CAUTION

AREA IN FRONT OF

ELECTRICAL PANEL

MUST BE KEPT CLEAR

FOR 36 INCHES

D. Provide the following label on front of all 480V Panelboards, Distribution Boards, and Switchboards:

CAUTION

AREA IN FRONT OF

ELECTRICAL PANEL

MUST BE KEPT CLEAR

FOR 48 INCHES

E. Provide the identification label/sign at all Emergency Power Off “EPO” pushbuttons, stating Panel Name pushbutton controls (shunts off).

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus insert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon:
   1. Minimum width: 3/16”.
   2. Tensile strength at 73-degrees F, according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185-degrees F.
   4. Color: Black.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Degrease and clean surfaces to receive nameplates and labels.

C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Self-Adhesive Identification Products: Clean surfaces before application, using materials, and methods recommended by manufacturer of identification device.

F. Attach sign and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable leads that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

H. Install nameplates and labels parallel to equipment lines.

I. Secure nameplates to equipment front using screws or rivets.

J. Identify empty conduit at each end with permanent ink marker. Indicate function and termination location of other end.

K. Identify underground conduits using underground warning tape. Install one tape per trench at 3-inches, or as indicated in Drawings, below finished grade.

L. Each outdoor conduit shall be labeled with the location of the opposite end of the conduit, and numbered as C# (Where C stands for conduit and # is increased with each conduit in the set).

1. For example, if 2 conduits are installed between vault 101 and vault 102, both conduits in vault 101 shall have a weatherproof label and be labeled “C1 To Vault 102” and “C2 To Vault 102” while both conduits in vault 102 shall be labeled “C1 To Vault 101” and “C2 To Vault 101” respectively. If a conduit ends in a building, the building name and room number shall be labeled as the destination.

3.2 COMMISSIONING REQUIREMENTS

A. The equipment and systems referenced in this Section shall be commissioned per Section 01 91 00 “Commissioning” and per Section 26 08 00 “Commissioning of Electrical Systems”. The Contractor has specific responsibilities for scheduling, coordination, startup, test development, testing, and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

SECTION 26 05 74

OVERCURRENT PROTECTION DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall provide a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

B. Series-rated equipment shall be prohibited for new equipment. Where series-rated electrical equipment is existing, specification shall be adhered to where applicable.

1.2 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. Insulated Cable Engineers Association (ICEA)
      a. ICEA P-32-382 Short Circuit Characteristics of Insulated Cables
      b. ICEA P-45-482 Short Circuit Performance of Metallic Shields and Sheaths on Insulated Cable
   2. Institute of Electrical and Electronics Engineers (IEEE)
      a. IEEE 141 Recommended Practice for Electric Power Distribution for Industrial Plants
      b. IEEE 242 Protection and Coordination of Industrial and Commercial Power Systems
      c. IEEE 399 Recommended Practice for Industrial and Commercial Power Systems Analysis
      d. IEEE 551 Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems
      e. IEEE 1584 Guide for Performing Arc-Flash Hazard Calculations
      f. IEEE C57.12.00 General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
      g. IEEE C57.96 Guide for Loading Dry-Tape Distribution and Power Transformers
   3. National Fire Protection Association
      a. NFPA 70E Standard for Electrical Safety in the Workplace

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 SUBMITTALS AND TRANSMITTALS

A. Transmit the following:
   1. Product Data: For computer software program to be used for studies.
   2. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.
   3. Arc-flash study input data, including completed computer program input data sheets. Provide after the approval of system protective devices submittals.
   4. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
      a. Provide three signed and sealed reports and one complete electronic copy including all computer files.
      b. Study shall include short circuit, selective coordination, and arc flash calculations.
      c. Study shall include arc flash labels for all system busses that could be worked on in an energized state.
      d. Provide study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Resident Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
      e. Study report at end of project to document as-built condition.
   5. Qualification Data: Professional Engineer
   6. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
   7. Operation and Maintenance Procedures: Provide maintenance procedures for use by Owner’s personnel that comply with requirements in NFPA 70E.
   8. The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one of the following:
   1. Operation Technology, Inc. (ETAP)
   2. SKM Systems Analysis, Inc. (Power Tools for Windows)

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center and panelboard designations.
   6. Utility source(s)

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit calculations: The calculation results shall include the following information:
   1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each system bus and equipment location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. No AC Decrement (NACD) ratio.
      e. Equivalent impedance.
      f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
      g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

F. Protective device coordination study: The study results shall include the following information:
   1. Protective device trip curves for relays, electronic trip breakers, thermal magnetic breakers, fuses, overloads, etc.
   2. Trip settings for selectable trip devices
   3. Trip settings for ground fault trip devices
   4. Motor starting curves
   5. Transformer inrush points
   6. Generator damage curves
   7. Time current coordination curves demonstrating selective coordination of all fault paths in the system

G. Arc-Flash Calculation: Calculation results shall include fault study input data, fault scenario descriptions, and fault-current calculations. The calculation results shall include definitions of terms and guidance for interpretation of computer printouts. The results shall include the following information for all buses and equipment in the system:
   1. Arcing fault magnitude
   2. Protective device clearing time
   3. Duration of arc
   4. Arc-flash boundary
   5. Working distance
   6. Incident energy
   7. Hazard risk category
   8. Recommended personal protective equipment
   9. Recommendations for arc-flash energy reduction

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in identification for electrical systems as stated elsewhere in the Contract Documents. Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall be in accordance with NFPA 70E. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
   1. Location designation
   2. Nominal voltage
   3. Flash protection boundary
   4. Hazard risk category
   5. Incident energy
   6. Working distance
   7. Engineering report number, revision number, and issue date

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective devices based on initial product transmittals, and for the as-built condition. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 SHORT-CIRCUIT ANALYSIS

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. All devices and equipment in the electrical distribution system shall be included in the study.

D. Analyze the electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Include studies

of system-switching configurations and alternate operations that could result in maximum fault conditions.

E. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage ac systems.

F. Calculate short-circuit momentary and interrupting duties for three-phase bolted faults and single line-to-ground faults at all busses and equipment in the distribution system including the following locations:
1. Electric utility's supply termination point
2. Switchgear
3. Substation primary and secondary terminals
4. Low-voltage switchgear
5. Motor-control centers
6. Automatic transfer switches
7. Panelboards
8. Disconnect switches and enclosed circuit breakers
9. Transformer primary and secondary

3.3 PROTECTIVE DEVICE COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 141 and IEEE 242 recommendations for fault currents and time intervals. (Comply with NEC for selective coordination NFPA 70; 240.12, 700.32, 701.32)

C. Transformer Primary Overcurrent Protective Devices:
1. Device shall not operate in response to the following:
a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping or clearing time of over current protective devices including relays, circuit breakers and fuses. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

E. Coordination-Study Report: Prepare and submit a written report including the following information:
1. Table of trip characteristics of fixed trip over current protective devices including thermal magnetic breakers and fuses.

2. Table of trip settings for selectable trip Overcurrent Protective Devices including the following information:
   a. Device tag.
   b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
   c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
   d. Ground-fault relay-pickup and time-delay settings.
3. Trip curves for all overcurrent protective devices in the system.
4. Trip curves for utility protective devices.
5. Coordination Curves: Time Current Curves (TCC) shall demonstrate selective coordination for all fault paths in the distribution system. TCC's shall graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Provide TCC for all fault paths in the system. Show the following information:
   a. Device tag.
   b. Voltage and current ratio for curves.
   c. Three-phase and single-phase damage points for each transformer.
   d. No damage, melting, and clearing curves for fuses.
   e. Cable damage curves.
   f. Transformer inrush points.
   g. Motor starting curves
   h. Generator damage curves
   i. Maximum fault-current cutoff point.

F. Provide completed data sheets for setting of overcurrent protective devices bound in a 3 ring binder.

3.4 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit and coordination analysis results as input data.

C. Calculate maximum and minimum fault-current scenarios.
   1. The minimum fault current scenario shall assume that the fault contribution from all sources is at a minimum and motor are not running.
   2. The maximum calculation shall assume a maximum fault contribution from all sources and shall assume all motors are operating at full-load.

D. Calculate the arc-flash protection boundary and incident energy at all buses and locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the

sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

G. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

H. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

I. Indicate recommended personal protective equipment at all busses and equipment in the system.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of Engineer of Record.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Gather and tabulate the following input data to support coordination study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.

8. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
9. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
10. Motor horsepower and NEMA MG 1 code letter designation.
11. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
12. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.6 LABELING

A. Apply arc-flash labels for all 600-V ac, 480-V ac, and 208-V ac electrical equipment including the following:
1. Utility service equipment
2. Panelboards
3. Disconnects
4. Motor-control centers
5. Combination motor starters
6. Low-voltage switchboards
7. Switchgear, switchboards
8. Control panel
9. Transformer primary and secondary
10. Load equipment such as HVAC equipment

3.7 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.8 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner’s maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.2 SUMMARY

A. The purpose of this section is to specify the Contractor's responsibilities relative to Division 26 and participation in the commissioning process. Refer to Division 01, Section 01 91 00 "Commissioning" for Contractor related commissioning requirements.

B. Organization of the commissioning program is primarily the responsibility of the Commissioning Authority. Execution of the program is primarily the responsibility of the Contractor with support from Division 26 for:
   1. Testing and startup of the electrical equipment.
   2. Completion and endorsement of pre-functional test checklists provided by the Commissioning Authority to assure Division 26 equipment and systems are fully operational and ready for functional testing.
   3. Providing qualified personnel to assist the Commissioning Authority with functional testing to verify equipment/system performance.
   4. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process which fulfill Contract and warranty requirements.
   5. Providing training for the systems specified in Division 26 with the coordination of the Owner by the Commissioning Authority.

C. Division 26 shall cooperate with the Commissioning Authority in the following manner:
   1. Allow sufficient time before final completion dates so that electrical testing, lighting control checkout, and functional testing can be accomplished.
   2. Provide labor and material to make corrections when required without undue delay.
   3. Put all electrical systems and equipment into full operation and continue the operation of the same during each working day of commissioning.

D. Test the entire electrical installation to assure compliance with Codes and proper system operation.

E. Electrical systems commissioning consists of static checks of component and system installations and actual testing of equipment conditions and functions.

F. The Commissioning Authority shall review and approve, prior to use, all test procedures and forms used and shall witness a varying fraction of the checks and testing performed by the Contractor. The Commissioning Authority shall

review the completed check and test documentation of the Contractor for all checks and tests.

1.3 SUBMITTALS

A. Thirty (30) days before any testing is conducted, submit an overall testing plan and schedule for electrical systems that lists the equipment, modes to be tested, dates of testing and parties conducting the tests. Put these tests into the master construction schedule. Keep this plan and schedule updated throughout the Project.

1.4 QUALITY ASSURANCE

A. A Certified Testing Company shall perform the work of this Section, and shall be qualified to test electrical equipment, and is a NETA (National Electrical Testing Association) Certified Testing Agency. The Certified Testing Company shall not be associated with the manufacturer(s) of the equipment or systems under test.

B. The Contractor shall provide all test equipment necessary to fulfill the checks and testing requirements. Test equipment shall have been calibrated within one (1) year of its use on this Project.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

A. Standard certified test equipment for commissioning shall be provided by the Commissioning Authority.

B. Proprietary test equipment required by the manufacturer shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

2.2 MATERIALS AND INSTRUMENTATION

A. All testing and commissioning materials and instrumentation shall be provided by and remain the property of the Contractor.

PART 3 – EXECUTION

3.1 WORK PRIOR TO COMMISSIONING

A. Specific pre-commissioning responsibilities of Division 26 are as follows:
   1. Normal startup services as required to bring each system into a fully operational state.
   2. Complete pre-functional test checklists for all equipment and systems to be commissioned.
   3. Portions of mechanical equipment startup requiring electrical connections and metering.
   4. Factory startup services for key equipment and systems specified in Division 26. The Division 26 Contractor shall coordinate this work with the manufacturer and the Commissioning Authority.

5. Demonstrate system readings as requested by the Commissioning Authority and adjust units to achieve specified operation.

3.2 PARTICIPATION IN COMMISSIONING

A. The Division 26 Contractor shall provide skilled technicians to startup and debug all systems within the Division 26 work (particularly with lighting equipment). These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Contractor. Contractor shall ensure the qualified technician(s) are available and present during the agreed upon schedules, and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation, and tools to service/commission the equipment, and an attitude/willingness to work with the Commissioning Authority to get the job and work done. A liaison or intermediary between the Commissioning Authority and qualified factory representative does not constitute the availability of a qualified technician for purposes of this work.

C. Provide skilled technicians to manipulate the following equipment and systems to be commissioned for functional testing:
   1. Power for mechanical systems.
   2. Lighting control systems.
   3. Daylighting control systems.
   4. Emergency power systems and restart testing.
   5. Inverters
   6. Metering systems

3.3 WORK TO RESOLVE DEFICIENCIES

A. Maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet acceptable performance.

B. Correction of work will be completed under the direction of the Owner/Architect and Engineer, with input from the Contractor, Equipment Supplier, and Commissioning Authority.

C. All members will have input and the opportunity to discuss, debate, and work out problems, and the Architect/Engineer will have final jurisdiction on the necessary work to be done to achieve performance and/or design intent.

3.4 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the Spring and Fall. Initial commissioning will be done as soon as Contract work is completed regardless of the season. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Heating equipment will be tested during winter design extremes. Cooling equipment will be tested during summer design extremes, with a fully occupied building. The

Contractor will be responsible to participate in the initial and the alternate peak season test of the systems required demonstrating performance.

B. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum, and at peak loads to observe system performance. The Contractor will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

3.5 ELECTRICAL SYSTEM TESTING

A. Conform to Commissioning Requirements.

B. Electrical system testing as required in other sections of this Specification shall be coordinated with the Commissioning Authority. The Commissioning Authority may witness testing performed by the Division 26 Contractor.

C. All testing documentation related to Division 26 equipment and systems, as specified in other sections of this Specification, will be provided to the Commissioning Authority for use and review.

D. Test wiring and electrical equipment to verify absence of grounds and short circuits, and verify proper operation, rotation, and phase relationships. Upon request, demonstrate operation of all equipment in accordance with the requirements of this Specification and the manufacturer’s recommendations. Provide instruments and personnel required to conduct these tests.

3.6 CHECKS AND TESTS

A. Checks are intended to begin upon completion of a component or equipment installation. Testing generally occurs later when systems are energized or nearing that point. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system as soon as possible, including all construction checklists and may require retesting portions of the system once all components are fully functioning.

B. The check and test procedures and record forms shall contain the following:
   1. The Subcontractor(s) executing checks and/or tests.
   2. A list of the integral components being inspected and tested, equipment tag numbers, manufacturer, model number, pertinent performance information/rating data.
   3. Test equipment used.
   4. Construction checklists associated with the components, if any.
   5. Any special required conditions of the checks or tests for each procedure.
   6. Items, conditions, or functions to be inspected, verified or tested, the checks and testing method given and a place provided with results recorded.
   7. Acceptance criteria (or reference by specific table where the acceptance criteria is found).
   8. For each procedure, list the technician performing the checks or tests and company, witnesses of the tests, and dates of tests.
   9. Sampling strategies used.

C. The test procedures for dynamic equipment like lighting controls, emergency generator, or fire alarm system shall contain more step-by-step procedures. The

test procedures and forms for more static components like panelboards, switchgear, circuit breakers, transformers, etc., can

D. At the Commissioning Authority's discretion, if large numbers or repeated deficiencies are encountered, the Contractor shall test and troubleshoot all remaining systems at issue on their own before commissioning with the Commissioning Authority resumes.

E. Sampling for Identical Units: When there are a number of identical units, at the Commissioning Authority's discretion, some or all procedures of a test for a piece of equipment or assembly may be omitted when these same tests on other pieces of identical equipment or assemblies were conducted without deficiency.

3.7 LOAD BALANCE

A. Checks shall be made for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.

B. Record all circuit changes on the As-Built Drawings.

C. Do not fabricate nameplates, or coverplates' labelling, prior to load balance test and adjustments.

3.8 GROUNDING TEST

A. Measure the Ohmic value of the existing electrical service entrance metallic "Electrical System Ground" with reference to "Earth Ground" using the "Multiple Ground Rod" method and suitable instruments. Maximum resistance to ground shall be as noted in Section 26 05 26 "Grounding and Bonding for Electrical Systems." If this resistance cannot be obtained, notify the Architect and Engineer in writing.

B. Provide paper copy of the test results in the record O&M manuals.

3.9 EQUIPMENT SPECIFIC TESTING

A. The following paragraphs define the testing requirements for each type of system or feature that is a part of this Project. The Commissioning Authority shall use this information to develop specific testing procedures for each of the systems to be commissioned. The Contractor shall be responsible for support, execution, and coordination of these tests as described in the Project Specifications, including intersystem tests and interlocks with systems in other Divisions.

B. Common Testing Requirements:

1. The following requirements apply to all electrical systems and features that are to be commissioned when referenced below. Tests shall:

   a. Verify functionality and compliance with the design intent for each individual sequence module in the sequences of operation. Verify proper operation of all control strategies, energy efficiency, and self-diagnostics, by stepping through each sequence and documenting equipment and system performance. Test every step in every written sequence and other significant modes, sequences, and operational features not mentioned in written sequences. These shall include: startup, normal operation, shutdown, scheduled on/off, unoccupied and manual modes, safeties, alarms, overrides, lockouts, and power failure.

b. Verify all alarm and high and low limit functions, and messages generated on all points with alarm settings.
c. Verify integrated performance of all components and control system components, including all interlocks and interactions with other equipment and systems.
d. Verify shutdown and restart capabilities both for scheduled and unscheduled events (e.g. power failure recovery and normal scheduled start/stop).
e. When applicable, demonstrate a full cycle from off to on and no load to full load and then to no load and off.
f. Verify time of day schedules and setpoints.
g. Verify all energy saving control strategies.
h. Verify that monitoring system graphics are representative of the systems and that all points and control elements are in the same location on the graphic as they are in the field.
i. Verify operator control of all control system points including proper security level access.
j. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems the NETA test procedures shall be part of the testing requirements of this Specification. Additional testing procedures may be listed in this Specification.

C. Common Acceptance Criteria:
1. The following common acceptance criteria apply to all equipment, assemblies, and features:
a. For the conditions, sequences, and modes tested, the equipment, integral components, and related equipment shall respond to varying loads, and changing conditions, and parameters appropriately as expected, according to the sequences of operation, as specified, according to acceptable operating practices, and the manufacturer’s performance specifications.
b. Verify that equipment operates within tolerances specified in: governing codes, acceptance criteria contained in construction documents, manufacturer’s literature, and according to good operating practice.
c. Systems shall accomplish their intended function and performance.
d. All safety trips shall require a manual reset to allow a system restart.
e. Resetting a manual safety shall result in a stable, safe, and predictable return to normal operation by the system.
f. Safety circuits and permissive control circuits shall function in all possible combinations of selector switch positions (hand, auto, inverter, bypass, etc.)
g. Other acceptance criteria are given in the equipment testing requirement articles or reference standards.
h. Additional acceptance criteria will be developed by the Commissioning Authority when detailed test procedures are developed.

i. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for electric power distribution equipment and systems, the NETA performance criteria shall apply.

3.10 TRAINING

A. The Division 26 Contractor will be required to participate in the training of the Owner's Engineering and Maintenance Staff for each electrical system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.2 SUMMARY

A. Lighting Control Panel (LCP).

B. Daylight Harvesting Controls.

C. Remote/Low-Voltage Switches.

D. Occupancy/Vacancy Sensors.

E. Provide complete installation of the occupancy sensor/daylight harvesting sensor based lighting control system using the approved factory shop drawings so that lighting is turned off automatically when a room or area is occupied and luminaires are dimmed accordingly when daylight is present. The time delay for occupancy sensors shall be set at no more than 15-minutes pursuant to the Seattle Energy Code.

F. The system shall include, but not be limited to the following list: pre-wired, microprocessor controlled relay or dimming panels with latching relays controlled via a complete list of communication based accessories including digital switches, digital photocells, digital panelboards, Digital Time Clock (DTC) and interface cards to dimming systems, building automation systems, thermostats, and other devices. The type of lighting control equipment and wiring specified in this Section is covered by the description: Microprocessor Controlled Digital Lighting Control system with RS-485 bus communications. Requirements are indicated elsewhere in these Specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring. They are not the work of this Section.

1.3 SYSTEM DESCRIPTION

A. Extent of lighting control system work is indicated by Drawings and by the requirements of this Specification. It is the intent of this Section to provide an integrated, energy saving lighting control system for a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

B. The lighting control system is a networked system that communicates via RS-485. The system must be able to communicate with fully digital centralized relay panels, as well as contain standalone small distributed relay panels (available with 0-10 volt dimming outputs). The system will also include digital switches, photocells, and occupancy sensors as indicated on Drawings. The intent of the Specification is to have all lighting controls provided by one manufacturer.

Lighting control system shall include all hardware and software. Software shall be resident within the lighting control system. System shall provide local access to all programming functions at the master LCP. Lighting control system shall have the capability to be remotely controlled via the internet or building wide Ethernet LAN. Remote computers are not part of this Section and will be provided by others.

C. System software shall provide real time status of each relay, each zone, and each group.

D. Lighting control system shall be able to be monitored by and take commands from a remote PC. At any time, should the remote PC go offline, all system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an online PC or server for normal operation are not acceptable.

E. All programs, schedules, time of day, etc., shall be held in non-volatile memory for an indefinite time exceeding 10 years in the event of power failure. At restoration of power, lighting control system shall implement programs required by current time and date. Time of day shall be battery backed for at least 10 years.

F. System shall be capable of warning of an impending off sweep by flashing lights Off/On once or twice (programmable) by relay or by zone prior to the lights being turned off. The warning interval times between the flash and the final lights off signal shall be definable for each zone. Additionally an audible signal shall be able to be programmed that gives a mild note on the first flash and a more insistent signal on the second one. Occupants shall be able to override any scheduled Off sweep using local wall switches within the occupied space. Occupant override time shall be locally and remotely programmable and not exceed 2-hours.

G. The system shall be capable of implementing On commands, Off commands, Raise (dimming) commands, Lower (dimming) commands for any relay, group or zone by means of digital wall switches, contact closure switches, time clock schedules, including offsets from dusk and dawn by up to 10 hours, photocell, PC software, or other devices connected to programmable inputs in a lighting control panel (LCP).

H. The lighting control system shall provide the ability to control each relay and each relay group per this Specification requirements. All programming and scheduling shall be able to be done locally at the master LCP and remotely via dial up modem or via the Internet. Remote connection to the lighting control system shall provide real time control and real time feedback.

I. Micro relay panels shall be capable of taking inputs from contact closure switches and outputting up to 8 independent 0V to 10V dimming signals. All micro relay panels and all devices connected to micro relay panels (switches, photocells, and occupancy sensors, etc.) shall be wired per lighting control manufacturer’s instructions.

J. System shall control lighting on/off and dimming functions by:
1. Time.
2. Available Daylight.
3. Occupancy Sensors.
4. Remote/Low-Voltage Switches.

K. The products specified in this Section shall provide a lighting control panel system of up to three panels with a maximum of 24 relays each and with low-voltage input devices including occupancy/vacancy sensors, daylight sensors, and switch stations for indoor and outdoor lighting applications.

L. The system shall be capable of turning lighting loads on/off using inputs, schedules, time clock, and astronomical clock programming.

M. The system shall be a complete, functional, lighting control system for the control of incandescent, low-voltage, neon, cold cathode, LED, fluorescent, and HID lighting.

N. The Contractor shall furnish and install a low-voltage lighting control system consisting of, but not be limited to, panels with relays, graphic user interfaces, controllers, enclosures, switches, photo sensors, occupancy sensors, low-voltage Class 2 wiring for input devices and data wiring between master and secondary panels as required for a complete, and operable lighting control system.

O. The system shall be capable of loading and saving programming via SD Card at the user interface.

1.4 REFERENCES

A. NEMA ICS 4 – Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Associate (NEMA); 2005.

B. NFPA 70 – National Fire Protection Association; National Electrical Code; 2020.

1.5 SUBMITTALS

A. Submit the manufacturer’s installation and startup manual and operating and maintenance manual as a part of the initial equipment submittal.

B. Provide submittal data on all products specified under Section 2 of this Specification and all other associated products that may not be specified, but that are required.

C. Submit manufacturer’s data on lighting control system and components including shop drawings, detailed point to point wiring diagrams, and floor plans showing occupancy and daylighting sensor locations. Provide typical mounting details for occupancy and daylighting sensors for this application.

D. Submittal package shall include, but not be limited to, the following:

1. Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
2. Product Data Sheets: Provide as part of the submittal package, detailed product data sheets for all major system components.
3. Shop Drawings: Submittal shall include shop drawings that accurately represent the system or systems specified herein. Shop Drawings shall include the name of the project, quantity, and physical dimensions of all major system components, wire sizes, and counts for all required connections, for all rooms, and between system components. Shop Drawings shall also include equipment and complete wiring diagrams for site, and whole building lighting controls as well as individual wiring diagrams for rooms with standalone lighting control systems. Provide complete equipment and wiring diagrams for all scenarios.

4. Contractor/Commissioning Worksheet: must be completed prior to factory startup.
5. Specifications Compliance: Submit a line-by-line comparison that describes the differences between each Specification's requirement and the equipment/systems being proposed. Comparison shall include a complete listing of how the proposed equipment/systems differ from that specified with regard to size, quantity, quality, method of control, features and functions, control software functions, and installation requirements.

1.6 QUALITY ASSURANCE

A. All components shall meet the National Electrical Code (NFPA 70) requirements, shall be UL listed, and shall meet requirements of the WA State NREC.

B. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 10-years.

C. Comply with NEC, NEMA, and FCC Emission requirements for Class A applications.

D. UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Configured to order or custom relay panels shall be UL Listed under UL 508, Industrial Control Panels.

E. Factory Assembly: All devices shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired, and ready for installation, requiring only the connection of lighting circuits and control terminations. All connections shall be made to clearly and permanently labeled termination points.

F. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per Specifications prior to shipment.

1.7 MAINTENANCE MATERIALS

A. Provide system O&Ms electronically.

B. Once startup is complete, provide electronic copy of as-built system documentation.

1.8 PROJECT CONDITIONS

A. Do not install equipment until the following conditions can be maintained in the spaces, where equipment is to be placed:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 95-percent, non-condensing.
   3. Lighting control system must be protected from dust during installation.

1.9 WARRANTY

A. All devices in lighting control system shall have a minimum 5-year manufacturer's warranty.

B. Warranty period shall begin after the completion of the installation and the system's startup and training, the point at which the system Owner receives

beneficial use of the control system or 1-year after shipment from the manufacturer, whichever occurs first.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

2.2 MANUFACTURERS

A. Wattstopper; basis of design.
   1. Panels: Wattstopper or approved equal.
   2. Standalone Rooms Low-Voltage Devices: Power Pack Control: Wattstopper or approved equal.
   3. Standalone Rooms Line Voltage: Sensor Switch or approved equal.

B. Or other reviewed and approved Manufacturers.
   1. Substitution requests shall comply with Division 01.
   2. Substitution requests shall include the following at a minimum:
      a. Equipment cut sheets for all equipment with part numbers, options, and accessories. Equipment, options, and accessories shall all be shown selected/highlighted.
      b. Warranty Information: warranties shall meet or exceed basis of design.
      c. Schematic details/diagrams that accurately represent the system or systems specified herein.
      d. Schematic diagrams shall include the name of the project, quantity, and physical dimensions of all major system components, wire sizes, and counts for all required connections, for all rooms, between system components.
      e. Schematic diagrams shall include all equipment and complete wiring diagrams for the following:
         1) Exterior lighting circuits and control equipment.
         2) Interior whole building lighting controls and equipment.
         3) Interface with emergency power – UL-924 transfer devices, UL-924 DMX bypass controllers, and UL-924 lighting control panels.
         4) Individual wiring diagrams, with room name and room number, for rooms with standalone lighting controls systems. Provide complete wiring diagrams showing all equipment, switching zones, daylight zones, complying with the basis of design and contained on the Contract Drawings.

2.3 LIGHTING CONTROL PANEL AND COMPONENTS

A. Relay Panels:

1. All lighting control panels (LCPs) shall be in a NEMA 1 rated enclosure with screw cover or hinged locking door. Other NEMA rated types are optional.
2. A barrier shall separate the high voltage and low voltage compartments of the panel and separate 120V, 208V, and 277V.
3. LCP input power shall be capable of accepting 120V, 208V, or 277V without rewiring.
4. Control electronics in the low-voltage section shall be capable of driving 2 to 48 relays, control any individual or group of relays, provide individual relay overrides, provide a master override for each panel, store all programming in non-volatile memory, after power is restored return system to the correct state for time of day, provide programmable dual blink warn timers for each relay or zone of relays, and be able to control Normally Open Latching (NOL) or Normally Closed Latching (NCL) relays.
5. Lighting control system shall be digital and consist of a Master LCP, standalone Micro LCPs (with up to 8 individual relays), digital switches, digital interface cards, occupancy sensors, and photocells. All components shall connect and be controlled via Category 5, 4 twisted pair cables with RJ-45 connectors, providing real time two-way communication with each system component. All Micro LCPs shall provide multiple inputs for photocells and occupancy sensors. Analog systems are not acceptable.

B. Low-Voltage Switches:
1. All switches shall be digital and communicate via RS-485. Contact closure style switches, except as specified for connection to the micro relay panel programmable contact closure inputs, shall not be acceptable. The programming for a digital switch shall reside in the switch itself, via double EPROM memory. Any digital switch button function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
2. Digital low voltage switches shall be devices that sit on the lighting control system bus. Digital switches shall connect to the system bus using the same cable and connection method required for relay panels. Each button shall be capable of being programmed for On only, Off only, Mix (Some On, some Off), On/Off (toggle), Raise (dim up) and Lower (dim down). Further, each button shall be able to be enabled or disabled over the bus. An audible alarm shall be available on all switches that can be programmed to beep on button push or with warning light blinks.
3. Keyed switches shall be similarly programmable and connect to the lighting control system bus.

C. DTC – Digital Electronic Time Clock:
1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept BACnet IP inputs.
2. The DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.

D. Photocell: Photocells shall be mounted in locations indicated on the Plans. Exact location shall be determined based on manufacturer’s sensor recommendations. Photocells used for exterior lights shall provide multiple trip points from (1) roof

mounted unit. All trip points shall be able to be changed remotely via Internet or dial up modem. Photocells requiring manual trip point adjustment are not acceptable. Photocells used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up, fade-down, etc. All settings shall be remotely accessible and adjustable. Systems providing local adjustment only are not acceptable. Photocells shall be certified to comply with the current energy code covering this Project at time of submittal of plans for building permit.

E. Interfaces:
   1. For future expansion capability, systems are to have available, all of the following interfaces. Verify and install only those interfaces indicated on the plans.
   2. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card on runs over 200 feet.

2.4 NETWORKED SWITCH STATIONS

A. Electrical contractor shall provide and install Networked Switch Stations of the types and quantities shown on the Drawings and as specified herein.

B. Networked Switch Stations shall be injection molded and designed to mount in a standard single gang junction box with standard decorator-style switch plate opening.

C. Networked Switch Stations shall be available in two (2) colors: White and Ivory.

D. Networked Switch Stations shall be available in multiple button configurations. Provide as indicated on plans.

E. Each button on a Networked Switch Station may be programmed to perform any of the following functions:
   1. Control any individual relay in any single lighting control panel.
   2. Control any group of relays in all of the lighting control panels.
   3. Control any preset in all of the lighting control panels.

F. Networked Switch Stations may be programmed for active and inactive times.

2.5 NETWORKED OCCUPANCY SENSORS

A. Electrical contractor shall provide and install Networked Occupancy Sensors of the types and quantities shown on the Drawings and as specified herein.

B. Each Networked Occupancy Sensor may be programmed to perform any of the following functions:
   1. Control any individual relay in any single lighting control panel.
   2. Control any group of relays in all of the lighting control panels.
   3. Control any preset in all of the lighting control panels.

C. Networked Occupancy Sensors may be programmed for active and inactive times.

D. Networked Occupancy Sensors shall be certified.

E. Networked Occupancy Sensors shall use digital technology and combine ultrasonic and passive infrared sensing technologies. Products that react to noise or ambient sound shall not be considered.

F. Networked Occupancy Sensors shall provide 2,000 sq. ft. of coverage minimum.

2.6 NETWORKED PHOTOSENSORS

A. Electrical contractor shall provide and install Networked Photo Sensors and Control Modules of the types and quantities shown on the Drawings and as specified herein.

B. Each photocell shall be mounted in the appropriate location for measuring the available daylight. Each photocell will have a separate control/calibration module mounted separately and in an accessible location.

C. Networked Photo Sensor Control Module shall transmit real time foot candle levels over network to any and all devices.

D. Networked Photo Sensor Control Module shall support zero to 1,000 footcandle range with (1) footcandle resolution.

E. Networked Photo Sensor Control Module shall provide six (6) programmable ON and OFF set points.

F. Networked Photo Sensor Control Module shall mount to standard 35mm DIN rail.

G. Networked Photo Sensor Control Module may be programmed to perform any of the following functions:
   1. Control any individual relay in any single lighting control panel.
   2. Control any group of relays in all of the lighting control panels.
   3. Control any preset in all of the lighting control panels.

H. Networked Photo Sensor Control Module shall be BacNet® certified.

I. Networked Photo Sensor Control Module may be programmed for active and inactive times.

2.7 NETWORKED DRY CONTACT INTERFACE MODULE

A. Electrical contractor shall provide and install Networked Dry Contact Interface Module of the types and quantities shown on the Drawings and as specified herein.

B. Each input on a Networked Dry Contact Interface Module may be programmed to perform any of the following functions:
   1. Control any individual relay in any single lighting control panel.
   2. Control any group of relays in all of the lighting control panels.
   3. Control any preset in all of the lighting control panels.

C. Networked Dry Contact Interface Module may be programmed for active and inactive times.

D. Data Protection and Storage: All programmed data shall be stored in non-volatile flash memory.

2.8 UL-924 TRANSFER DEVICES

A. Electrical contractor shall provide and install UL-924 transfer devices of the types and quantities shown on the Drawings and per the basis of design contained in the Drawings. Provide all required components and accessories such that emergency lights turn automatically on and raise to full bright upon loss of normal power.

2.9 PLUG LOAD CONTROLLERS

A. Electrical contractor shall provide and install plug load controllers of the types and quantities required per the Drawings.

B. Plug load controllers shall include:
1. 120 VAC, 60 Hz rated for 20A total load. Controller carries application-specific UL 20 rating for receptacle control.
2. One relay configuration with additional connection for unswitched load
3. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated).
4. Factory default operation is Auto-on/Auto-off, based on occupancy
5. Provide a wireless transmitter that can be connected to any Cat 5e network of the lighting controls that will communicate the room's occupancy state to receptacles mounted in the area with integral relays. Binding of the transmitter to the receptacles shall be accomplished by pressing a test button on the transmitter, and then a test button on the receptacle.

PART 2 – EXECUTION

3.2 INSTALLATION

A. Mount relay control cabinets adjacent to respective lighting panelboard. Cabinet shall be surface or flush mount, as per plans. Wiring between relay control cabinets and panelboards shall be in accordance with local codes and acceptable industry standards. Under no circumstances will any extra payment be authorized for the Electrical Contractor or the General Contractor due to the Electrical Contractor’s lack of knowledge or understanding of any and all prevailing codes or specified manufacturer’s installation requirements. Neatly lace and rack wiring in cabinets. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to failure to protect them shall be the sole responsibility of the installing contractor.

B. Provide outlet boxes, single or multi-gang, as shown on the Drawings for the low-voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. Electrical contractor is specifically responsible to supply and install the required low-voltage cable, Category 5, 4-twisted pair, with RJ-45 connectors (commonly referred to as Cat 5 patch cable) between all switches and control panels. Field test all Cat 5 patch cable with a recognized cable tester. All low-voltage wire shall be run in conduit, per local codes.

C. Manufacturer shall provide on all systems of more than 2 control panels, a crimping kit with sufficient approved EZ Brand RJ-45 connectors to populate the whole system. A simple manual that shows all the pitfalls of crimping RJ-45s and how to do it correctly must be both provided and read by the installing contractor.

D. Wiring:
1. Do not mix low-voltage and high voltage conductors in the same conduit, no exceptions.
2. Ensure low-voltage conduits or control wires do not run parallel to current carrying conductors.

3. The specified lighting control system shall be installed by the electrical contractor, whom shall make all necessary wiring connections to external devices and equipment, and also includes photocells. Electrical contractor shall install wire per manufacturer’s instructions.

3.3 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Install sensors in accordance with manufacturer's instructions. Do not exceed coverage limits specified in manufacturer's written instructions.

C. Where sensors are integral to light fixtures, coordinate orientation and location of fixture with sensor position.

3.4 DEVICE INSTALLATION

A. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

B. Arrangement of Devices: Group adjacent switches under single, multigang wall plates.

3.5 INSTALLATION AND SETUP

A. Verify that conduit for line voltage wires enter the panels in line voltage areas and conduit for low-voltage control wires enter the panels in low-voltage areas. Refer to manufacturer’s plans and approved shop drawings for location of line and low-voltage areas. This is especially applicable in projects where back boxes are shipped in advance. It is the responsibility of the contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

B. For approved contact closure switches, use #18 AWG stranded conductors. For all other digital switches, provide wiring as required by the system manufacturer.

C. For classroom digital switches, provide wiring as required by the system manufacturer.

D. Contractor shall test all low-voltage cabling for integrity and proper operation prior to turn over. Verify with system manufacturer, all wiring and testing requirements.

E. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Setup, commissioning of the lighting control system, and Owner instruction includes:
1. Confirmation of entire system operation and communication to each device.

2. Confirmation of operation of individual relays, switches, occupancy sensors, and daylight sensors.
3. Confirmation of System Programming, photocell settings, override settings, etc.
4. Provide training to cover installation, maintenance, troubleshooting, programming, repair, and operation of the lighting control system.

F. Panels shall be located so that they are readily accessible and not exposed to physical damage.

G. Panel locations shall be furnished with sufficient working space around panels to comply with the National Electrical Code (NEC).

H. Panels shall be securely fastened to the mounting surface by at least 4 points.

I. Unused openings in the cabinet shall be effectively closed.

J. Cabinets shall be grounded as specified in the NEC.

K. Lugs shall be suitable and listed for installation with the conductor being connected.

L. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

M. Maintain the required bending radius of conductors inside cabinets.

N. Clean cabinets of foreign material such as cement, plaster, and paint.

O. Distribute and arrange conductors neatly in the wiring gutters.

P. Follow the manufacturer’s torque values to tighten lugs.

Q. Before energizing a panel, the following steps shall be taken:
1. Retighten relay connections to the manufacturer’s torque specifications. Verify that required connections have been furnished.
2. Remove shipping blocks from component devices and the panel interior.
3. Remove debris from panel interior.

R. Follow manufacturer’s instructions for installation and all low-voltage wiring.

S. Service and Operation Manuals:
1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
2. Manuals shall include instructions necessary for proper operation and servicing of systems and shall include complete wiring circuit diagrams of systems, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built color coding used on cables. Programming forms of systems shall be submitted with complete information.
3. Comply with energy code lighting control system “Acceptance Requirements”. Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. These tests may require that a responsible party certify that controls are installed and calibrated properly. This is the installing contractor’s responsibility. Verify requirements with building authority.

3.6 SUPPORT SERVICES

A. System Startup and Commissioning: Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify the following:
   1. All occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.
   2. Occupancy sensors and daylighting sensors are operating within the manufacturers specifications.
   3. Sensors and relay panels interact as a complete and operational system to meet the design intent.

B. Manufacturer to provide a written statement verifying that the system meets the above requirements.

3.7 SEQUENCE OF OPERATION

A. Order of Operation of a Network System:
   1. The control network consists of physical components called devices (or 'nodes'), each performing specific functions.
   2. Each device has associated with it a number of objects that pertain to the device's overall function. An object is not only a physical entity, but also a software entity that is embedded in the neuron chip contained within a device. If the device has several functions, it can contain several objects that affect those functions.
   3. On the network the messages are transmitted between the objects. Messages are also referred to as Network Variables. Objects each are capable of receiving and sending.
   4. Each device is physically addressed via 3 address wheels to locate it on the network with the Neuron chip on each device having its own firmware based ID similar to a MAC address on IP devices.
   5. When the button is pushed on a switch station, or a photocell controller senses a change in light level, its object broadcasts a network variable or message, which is then read by the objects on the network to which the message is addressed. If the messages is to turn on a relay, that device (relay control panel) has an object on it that relates to the relay in question. When the relay has been turned on, a message is broadcast back and the object on the switch receives an update of the status of relay, turning on its LED.
   6. Network systems are able to communicate with other control systems via BACnet, allowing for integration points from each system to be linked across one system from another.
   7. The network systems can also communicate with other systems via contact closure.

B. Order of Operation of an Occupancy Sensor:
   1. A dual technology occupancy sensor works by broadcasting an ultrasonic compression wave into the room. It reads the return wave and if any Doppler shifts occur in the return wave, it knows there's movement in the room and opens the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.
   2. The passive infrared portion of the sensor is reading the background infrared radiation in the room. If that level changes in the range that the sensor is designed to look for, it identifies a movement in the room and

opens the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.

3. When the sensor identifies movement, it closes the control signal to the Relay/Power Pack to close the relay the switch leg is connected to, turning on the lights.
4. The sensor can be programmed to require both types of sensors, Ultrasonic and Passive Infrared, to be in agreement to turn on the lights, or, that either type “seeing” movement will turn on the lights.
5. The sensor will hold the relay closed, keeping the lights on, as long as the Sensor identifies motion. If the sensor stops seeing motion for the programmed or learned amount of time, it will open the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.
6. This functionality is the same for single sensor type occupancy sensors.

C. Order of Operation of 0-10V Light Sensor Controlling a Solid State Driver (SSD):
1. A 0-10V Light Sensor works by receiving a 10VDC signal from the SSDs being controlled. Based on the amount of ambient light striking the photocell in the Light Sensor, a variable voltage level from 0 to 10VDC is returned to the SSDs being controlled.
2. A 10VDC return to the SSDs being controlled will result in maximum dimming of the SSDs.

D. Order of Operation of a Daylight Harvesting Controller within a Daylight Area:
1. The daylighting and occupancy sensing and override switches are controlled by a control module and power pack which has three 5 relays for on/off control and 5 channels of 0-10V dimming for daylight harvesting.
2. The control module receives a signal from the occupancy sensor when a person enters the room. Depending on how the LV switches are connected to the module, the lights either come on with occupancy or after the AUTO or I/O LV button is pushed. The level at which the lights come on in a given daylight zone is determined by the lighting level sensed by the open loop photocell which gathers daylight entering the controlled area.
3. If the daylight sensed is great enough in relation to the settings entered into the module, the lighting in one or multiple zones may not come on at all. The amount the lights in a given daylight zone are dimmed is determined by setting the control module with the existing light level and the desired light level in the zone. The module then takes the amount of light the photocell is seeing entering the area controlled and extrapolates that into the correct level of dimming.
4. The optional dimming control will allow all controlled zones to be dimmed even to any level below the level set by the photocell. The lighting may also be overridden off across the entire area.

3.8 DOCUMENTATION

A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the Drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.

B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. The accurate “as-built” shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches, and location of the photocell. Original to be given to the owner, and copies placed inside the door of each LCP.

3.9 SITE VERIFICATION

A. Verify all wiring conditions installed under separate sections at the time of panel installation as acceptable to and in accordance to the manufacturer’s installation instructions supplied with the products.

3.10 FIELD MEASUREMENTS

A. The electrical contractor shall be responsible for field measurements and coordination of physical size as appropriate for the product location. The electrical contractor shall coordinate with all Architectural requirements for the space that the panel is located.

3.11 INSPECTION

A. The electrical contractor shall inspect all materials prior to installation and notify the manufacturer of any unacceptable materials prior to installation.

3.12 SITE PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of construction including storage, preparation, testing, and cleanup.

3.13 SERVICE AND SUPPORT

A. Startup: Contractor shall contact local factory representation 3 weeks prior to startup date to schedule technician to the jobsite for initial system energization, programming, and owner training. Contractor shall be available at the time of startup to perform any corrections required by the factory authorized technician.

B. Provide a factory technician for onsite training of the Owner’s Representatives and maintenance personnel. Contractor is responsible for coordinating with all trades to ensure that all Owner’s Representatives are available at the scheduled training date/time, which will occur immediately following system programming.

3.14 SYSTEM TRAINING

A. Manufacturer shall provide factory authorized technician to train Owner’s personnel in the operation, programming, and maintenance of the lighting control system, including all occupancy sensors and daylight harvesting controls.

3.15 SYSTEM PROGRAMMING

A. Manufacturer shall provide system programming including:
   1. Wiring documentation.
   2. Switch operation.
   3. Telephone overrides (if applicable)
   4. Operating schedules.

3.16 CLEANING

A. Refer to Division 01 – Execution Requirements.

B. Clean photocell lenses as recommended by the Manufacturer.

C. Clean all switch faceplates.

3.17 COMMISSIONING REQUIREMENTS

A. The equipment and systems referenced in this Section are to be commissioned per Section 01 90 00 “Commissioning” and per Section 26 08 00 “Commissioning of Electrical Systems”. The Contractor has specific responsibilities for scheduling, coordination, startup, test development, testing, and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Service and distribution switchboards rated 600 V and less.
   2. Surge protection devices.
   3. Disconnecting and overcurrent protective devices.
   4. Instrumentation.
   5. Control power.
   6. Identification.
   7. Mimic bus.

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
   1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
   5. Detail utility company's metering provisions with indication of approval by utility company.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include diagram and details of proposed mimic bus.
   8. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:
   1. For arc-flash hazard analysis.
   2. For arc-flash labels.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Routine maintenance requirements for switchboards and all installed components.
      b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
      c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.8 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:
   1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 104 deg F.
      b. Altitude: Not exceeding 6600 feet.

1.9 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory in-

stalled interconnection wiring that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Siemens (Basis of Design)

B. Eaton Cutler-Hammer

C. Square D (Schneider Electric)

D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relived from meeting these Specifications in their entirety. Products in compliance with the Specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.3 SWITCHBOARDS

A. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:
1. Main Devices: Panel mounted.
2. Branch Devices: Panel mounted.

3. Sections front and rear aligned.

H. Front- and Side-Accessible Switchboards:
1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Section Alignment: Front and Rear aligned.

I. Front- and Rear-Accessible Switchboards:
1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel and fixed, individually mounted.
3. Sections front and rear aligned.

J. Indoor Enclosures: Steel, NEMA 250, Type 1.

K. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

L. Barriers: Between adjacent switchboard sections.

M. Insulation and isolation for main and vertical buses of feeder sections.

N. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

O. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

P. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks.

Q. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

R. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

S. Buses and Connections: Three phase, four wire unless otherwise indicated.
1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
3. Copper feeder circuit-breaker line connections.
4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
5. Ground Bus: 1/4-by-2-inch hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.

6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
7. Disconnect Links:
   a. Isolate neutral bus from incoming neutral conductors.
   b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

T. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

U. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.4 SURGE PROTECTION DEVICES

A. SPDs: Comply with UL 1449, Type 2.

B. Features and Accessories:
1. Indicator light display for protection status.
2. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
3. Surge counter.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Line to Line: 1000 V for 208Y/120 V.

E. SCCR: Equal or exceed 100 kA.

F. Nominal Rating: 20 kA minimum.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: 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 circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long and short time adjustments.

d. Ground-fault pickup level, time delay, and I squared t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. MCCB Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
   c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   d. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
   e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
   f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
   g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
   h. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

2.6 INSTRUMENTATION

A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
   1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
      a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
      b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
      c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
      d. Megawatts: Plus or minus 1 percent.
      e. Megavars: Plus or minus 1 percent.
      f. Power Factor: Plus or minus 1 percent.
      g. Frequency: Plus or minus 0.1 percent.
      h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
      i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
      j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

B. Impulse-Totalizing Demand Meter:
1. Comply with ANSI C12.1.
2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
3. Cyclometer.
4. Four-dial, totalizing kilowatt-hour register.
5. Positive chart drive mechanism.
6. Capillary pen holding a minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
8. Capable of indicating and recording five-minute integrated demand of totalized system.

2.7 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

2.8 IDENTIFICATION

A. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.

B. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

C. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.

D. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.
1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

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

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in either Section 03 30 00 "Cast-in-Place Concrete".
   1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to switchboards.
   6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Install filler plates in unused spaces of panel-mounted sections.

F. Install overcurrent protective devices, surge protection devices, and instrumentation.
   1. Set field-adjustable switches and circuit-breaker trip ranges.

G. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Acceptance Testing:
      a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
      b. Test continuity of each circuit.
   2. Test ground-fault protection of equipment for service equipment per NFPA 70.
   3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   5. Perform the following infrared scan tests and inspections, and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
      c. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Switchboard will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 74 “Overcurrent Protection Device Arc-Flash Study."

3.7 CLEANING

A. Touch up scratched or marred surfaces to match original finish. Remove all dirt and contaminants from interior, components, and exterior surfaces.

3.8 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Load centers.
   4. Electronic-grade panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
   3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   4. Detail bus configuration, current, and voltage ratings.
   5. Short-circuit current rating of panelboards and overcurrent protective devices.
   6. Include evidence of NRTL listing for SPD as installed in panelboard.
   7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   8. Include wiring diagrams for power, signal, and control wiring.

9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI, GFEP, AFCI Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

A. Environmental Limitations:
1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.
   1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Siemens (Basis of Design)

B. Eaton Cutler-Hammer

C. Square D (Schneider Electric)

D. Or approved equal

E. Approval of the above manufacturers is contingent on their equipment size to be suitable for the installation situation and physical space indicated on the Drawings. Manufacturer shall verify this requirement.

2.2 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Height: 84 inches maximum.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   4. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Same finish as panels and trim.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

E. Incoming Mains:
1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

F. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
a. Plating shall run entire length of bus.
b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

G. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

H. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

I. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 20 percent.

J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
   1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
   2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.4 POWER PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches high, provide two latches, keyed alike.

C. Mains: Circuit breaker, Fused switch, or Lugs only as shown on Drawings.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: Fused switches if shown on Drawings.

G. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
   1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
   2. External Control-Power Source: 120-V branch circuit.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker or lugs only.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
   1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
   2. External Control-Power Source: 120-V branch circuit.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.
   1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

2.6 LOAD CENTERS

A. Load Centers: Comply with UL 67.

B. Mains: Circuit breaker or lugs only.

C. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.

E. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.7 ELECTRONIC-GRADE PANELBOARDS

A. Panelboards: NEMA PB 1; with factory-installed, integral SPD; labeled by an NRTL for compliance with UL 67 and UL 1449 after installing SPD.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

C. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

D. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

E. SPD.
   1. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
   2. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
      a. Line to Neutral: 700 V for 208Y/120 V.
      b. Line to Ground: 700 V for 208Y/120 V.
      c. Neutral to Ground: 700 V for 208Y/120 V.
      d. Line to Line: 1200 V for 208Y/120 V.
   3. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:
      a. Line to Neutral: 700 V.
      b. Line to Ground: 700 V.
      c. Neutral to Ground: 700 V.
      d. Line to Line: 1200 V.
   4. SCCR: Equal to the SCCR of the panelboard in which installed.
   5. Inominal Rating: 20 kA minimum.

F. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.

2.8 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic Trip Circuit Breakers:
      a. RMS sensing.
      b. Field-replaceable rating plug or electronic trip.
      c. Digital display of settings, trip targets, and indicated metering displays.
      d. Multi-button keypad to access programmable functions and monitored data.
      e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
      f. Integral test jack for connection to portable test set or laptop computer.
      g. Field-Adjustable Settings:
         1) Instantaneous trip.
         2) Long- and short-time pickup levels.
         3) Long and short time adjustments.
         4) Ground-fault pickup level, time delay, and I squared T response.
   4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
   5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
   6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
   7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
   8. Subfeed Circuit Breakers: Vertically mounted.
   9. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Breaker handle indicates tripped status.
      c. UL listed for reverse connection without restrictive line or load ratings.
      d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

f. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
h. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
i. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
j. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
k. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
l. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
m. Multipole units enclosed in a single housing with a single handle.
n. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
o. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.9 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
   1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.10 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount top of trim 90 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box.

G. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

H. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth in damp, wet, or dirty locations. Orient steel slotted supports vertically.

I. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

K. Install filler plates in unused spaces.

L. Stub four 1-inch spare empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch spare empty conduits into raised floor space or below slab not on grade.

M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

N. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
      c. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   2. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer’s written requirements. Provide documentation of the torque connections to engineer for closeout documentation. If values do not match manufacturer recommendation, contractor to provide additional torquing and provide documentation that the requirements have been adhered to.

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

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 74 “Overcurrent Protection Device Arc-Flash Study."

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Standard-grade receptacles, 125 V, 20 A.
2. USB receptacles.
3. GFCI receptacles, 125 V, 20 A.
4. Twist-locking receptacles.
5. Toggle switches, 120/277 V, 20 A.
6. Decorator-style devices, 20 A.
7. Occupancy sensors.
8. Digital timer light switches.
9. Residential devices.
10. Wall-box dimmers.
11. Wall plates.
12. Service poles.

1.3 DEFINITIONS

A. AFCI: Arc-fault circuit interrupter.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hubbell Incorporated: www.hubbell-wiring.com

B. Leviton Manufacturing Company, Inc.: www.leviton.com

C. Pass & Seymour, a brand of Legrand North America, Inc.: www.legrand.us

D. Cooper Wiring Devices: www.cooperwiringdevices.com

E. Or approved equal

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with requirements in this Section.

F. Devices for Owner-Furnished Equipment:
   1. Receptacles: Match plug configurations.

G. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected to Essential Electrical System: Red.
   3. Isolated-Ground Receptacles: Orange.

H. Wall Plate Color: For plastic covers, match device color.

I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.3 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:
   1. Description: Two pole, three wire, and self-grounding.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Standards: Comply with UL 498 and FS W-C-596.

B. Isolated-Ground Duplex Receptacles, 125 V, 20 A:
   1. Description: Straight blade; equipment grounding contacts shall be connected only to green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts. Two pole, three wire, and self-grounding.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Standards: Comply with UL 498 and FS W-C-596.

C. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
   1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Standards: Comply with UL 498 and FS W-C-596.
   4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

D. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
   1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Standards: Comply with UL 498.
   4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

E. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
   1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Standards: Comply with UL 498.
   4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.4 USB RECEPTACLES

A. USB Charging Receptacles:
   1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
   2. USB Receptacles: Dual and quad, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
   3. Standards: Comply with UL 1310 and USB 3.0 devices.

B. Tamper-Resistant Duplex and USB Charging Receptacles:
   1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
   2. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
   3. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
   4. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
   5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.5 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:
   1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
   2. Configuration: NEMA WD 6, Configuration 5-20R.
   3. Type: Non-feed through.

4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.6 TWIST-LOCKING RECEPTACLES

A. Twist-Lock, Single Receptacles, 120 V, 20 A:
1. Configuration: NEMA WD 6, Configuration L5-20R.
2. Standards: Comply with UL 498.

B. Twist-Lock, Single Receptacles, 250 V, 20 A:
1. Configuration: NEMA WD 6, Configuration L6-20R.
2. Standards: Comply with UL 498.

C. Twist-Lock, Isolated-Ground, Single Receptacles, 125 V, 20 A:
1. Grounding: Equipment grounding contacts shall be connected only to green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
2. Configuration: NEMA WD 6, Configuration L5-20R.
3. Standards: Comply with UL 498.

2.7 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

E. Key-Operated, Single-Pole Switches, 120/277 V, 20 A:
1. Description: Factory-supplied key in lieu of switch handle.
2. Standards: Comply with UL 20 and FS W-S-896.

2.8 DECORATOR-STYLE DEVICES, 20 A

A. Decorator Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.

B. Decorator Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Decorator, Tamper- and Weather-Resistant, Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

D. Decorator Single-Pole Switches, 120/277 V, 20 A:
1. Comply with UL 20.

2.9 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:
1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Adjustable time delay of 20 minutes.
5. Able to be locked to either Automatic or Manual-On mode.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

2.10 TIMER LIGHT SWITCH

A. Digital Timer Light Switch:
1. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Integral relay for connection to BAS.

2.11 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant, GFCI Receptacles, 125 V, 15 A:
1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.

3. Standards: Comply with UL 943 and UL 1699.

B. Residential-Grade, Tamper-Resistant, AFCI Receptacles, 125 V, 15 A:
1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 943 and UL 1699.

C. Residential-Grade, Tamper-Resistant Receptacles, 125 V, 15 A:
1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 498.

D. Weather- and Tamper-Resistant Receptacles, 125 V, 15 A:
1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 498.
4. Marked as "Weather Resistant."

E. Fan-Speed Controls:
1. Description: Modular, 120-V ac, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
2. Standards: Comply with UL 1917.
3. Continuously adjustable slider, 5 A.
4. Three-speed adjustable slider, 1.5 A.

F. Telephone Outlet:
1. Description: Single RJ-11 jack for terminating Category 3, balanced twisted pair cable.
2. Standards: Comply with UL 1863.

2.12 DIMMERS

A. Wall-Box Dimmers:
1. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
2. Control: Continuously adjustable slider; with single-pole or three-way switching.
3. Standards: Comply with UL 1472.
4. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.13 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished and Unfinished Spaces: Smooth, high-impact thermoplastic.
3. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant with lockable cover.

2.14 SERVICE POLES

A. Description:
   1. Factory-assembled and -wired units to extend power, voice, and data communications from distribution wiring concealed in ceiling to devices or outlets in powered furniture.
   2. Poles: Height adequate to extend at least 6-inches above ceiling, and with separate channels for power wiring and voice/data communications cabling. Where separate channels for both systems is not available, separate poles shall be provided for each system.
   3. Mounting: Ceiling trim flange, with concealed bracing arranged for positive connection to ceiling supports; with pole foot and furniture attachment.
   4. Finishes: Manufacturer's standard painted finish and trim combination.
   5. Wiring: Sized for minimum of ten No. 10 AWG power and ground conductors and a minimum of 12, four-pair, Category 6 voice and data communications cables.

B. Source Limitations: Obtain power feed pole, ceiling trim, wire harnesses, components, and accessories from single source from single manufacturer of the modular furniture system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Device or equipment mounting height given herein the Specifications, Drawings, and/or Contract Documents, are intended to provide general guidelines pursuant to industry standards. Such guidelines may not be exact or accurate and may or may not conflict with other trades installation without verification. Provide field coordination and verification with other divisions.
   1. Verify counter heights with cabinet installer and cabinet shop drawings, prior to rough-in for outlets.
   2. Examine other trades shop drawings to ensure that such mounting heights are appropriate for the intended device use, and the device locations do not conflict with other components. Immediately report impaired device use and conflict/location to the Owner's Representative for resolution. Devices may be moved up to 20-feet without additional compensation.
   3. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

B. Verify that final surface finishes are complete, including painting.
   1. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
   2. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

C. The Drawings are diagrammatic and indicate generally the locations of materials, equipment, and devices. These Drawings shall be followed as closely as possible.
   1. Coordinate the work under this Section with the Architectural, Structural, Plumbing, Heating and Air-Conditioning, and the drawings of other trades for exact dimensions, clearances, and roughing-in locations.
   2. Cooperate with other trades in order to make minor field adjustments to accommodate the work of others.
   3. Devices and outlets can be field located by Owner's Representative within 20-feet of the designed locations prior to rough-in work, without extra compensation.

3.3 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.4 GFCI RECEPTACLES

A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

3.5 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

3.6 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cartridge fuses rated 600 V ac and less for use in the following:
      a. Control circuits.
      b. Motor-control centers.
      c. Panelboards.
      d. Switchboards.
      e. Enclosed controllers.
      f. Enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
   1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
      a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
   2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   3. Current-limitation curves for fuses with current-limiting characteristics.
   4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
   5. Coordination charts and tables and related data.
   6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 77 00 "Closeout Procedures," Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. Ambient temperature adjustment information.
   2. Current-limitation curves for fuses with current-limiting characteristics.

3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bussman by Eaton: http://www.cooperindustries.com/content/public/en/products/fuses.html
B. Edison Fuse, Inc.
C. Ferraz Shawmut, Inc.
D. Littelfuse, Inc.
E. Or other reviewed and approved Manufacturers.
F. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting, time delay.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting, time delay.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
7. Type T: 600-V, zero- to 800-A rating, 200 kAIC, very fast acting, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA FU 1 for cartridge fuses.
D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Service Entrance: Class L, fast acting.
   2. Feeders: Class L, fast acting.
   3. Motor Branch Circuits: Class RK1, dual-element, time delay.
   4. Large Motor Branch (601-4000 A): Class RK1, dual-element, time delay.
   5. Power Electronics Circuits: Class J, high speed.
   6. Other Branch Circuits: Class RK1, time delay.
   7. Control Transformer Circuits: Class CC, time delay, control transformer duty.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s) in location as indicated in the field by Owner.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replace-

ment information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Shunt trip switches.
   4. Molded-case switches.
   5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
      b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton Cutler-Hammer.

B. Siemens.

C. Square D (Schneider Electric).

D. Or approved equal.

2.2 PERFORMANCE REQUIREMENTS

A. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.3 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with NFPA 70.

2.4 FUSIBLE SWITCHES

A. Type HD, Heavy Duty:
1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.5 NONFUSIBLE SWITCHES

A. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.

8. Service-Rated Switches: Labeled for use as service equipment.

2.6 SHUNT TRIP SWITCHES

A. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.

B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, or 100A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

C. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses with a control power transformer of enough capacity to operate shunt trip, pilot, indicating and control devices.

D. Accessories:
1. Oiltight key switch for key-to-test function.
2. Isolated neutral lug; 100 percent rating.
3. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
4. Form C alarm contacts that change state when switch is tripped.
5. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.
6. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
7. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
8. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
9. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
10. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
11. Hookstick Handle: Allows use of a hookstick to operate the handle.
12. Lugs: Mechanical type, suitable for number, size, and conductor material.
13. Service-Rated Switches: Labeled for use as service equipment.

2.7 MOLDED-CASE SWITCHES

A. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

B. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

C. Features and Accessories:
1. Standard frame sizes and number of poles.
2. Lugs:
a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
b. Lugs shall be suitable for 167 deg F (75 deg C) rated wire.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and

shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
7. Alarm Switch: One NO contact that operates only when switch has tripped.
8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
10. Electrical Operator: Provide remote control for on, off, and reset operations.

2.8 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:
   1. Visual and Mechanical Inspection:
      a. Inspect physical and mechanical condition.
      b. Inspect anchorage, alignment, grounding, and clearances.
      c. Verify that the unit is clean.
      d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
      e. Verify that fuse sizes and types match the Specifications and Drawings.

f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:
1) Use a low-resistance ohmmeter.
a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:
a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:
1. Visual and Mechanical Inspection:
a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.

e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:
    1) Use a low-resistance ohmmeter.
        a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:
    a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
    b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
    c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
    d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
    e. Determine the following by primary current injection:
        1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
        2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed

manufacturer's published time-current characteristic tolerance band, including adjustment factors.

3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.

4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.

g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.

h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.

i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

4. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide complete and operational lighting system including all fixtures, poles, lamps, hardware, mounting hardware including structural and pendant cable supports, installation appurtenances, wiring, and connections as required.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   6. Photometric data and adjustment factors based on laboratory tests.
      a. Retain or "Manufacturers' Certified Data" or "Testing Agency Certified Data" Subparagraph below. Retain first subparagraph if photometric data, based on testing by accredited manufacturers' laboratories, is considered adequate for luminaires in this Project. Retain second subparagraph if photometric data for one or more luminaires are based on independent laboratory tests; coordinate with the Interior Lighting Fixture Schedule on Drawings to indicate which units shall meet this requirement. See the Evaluations.
      b. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
      c. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency.

Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

1.5 SUBMITTALS

A. Provide complete and operational lighting system including all fixtures, lamps, hardware, installation appurtenances, wiring, and connections as required.

B. Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

C. Field quality control reports.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of Project:
   1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts/Drivers: Two percent of total quantity installed for each type, but not less than one of each type.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications, Preferred Experience: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

C. Provide minimum 50,000 hour lamp life on all LED modules.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Luminaires: Refer to Light Fixture Schedule in Drawings.

B. Ballasts/Drivers:
1. Advance.
2. Osram Sylvania.
3. Lutron.

C. Lamps:
1. GE.
2. Philips.
3. Osram Sylvania.

D. Light Emitting Diodes (LEDs):
1. Cree.
2. Philips.
3. Nichia.

E. Or other reviewed and approved Manufacturers.
1. Substitution requests must be submitted within 10-working days prior to Bid.
2. Substitution requests shall comply with Division 01.
3. Substitution requests shall include the following at a minimum:
a. Lighting cut sheets for all light fixtures and poles with part numbers, options, and accessories. Equipment, options, and accessories shall all be shown selected/highlighted.
b. Warranty information. (Warranties shall meet or exceed basis of design).
c. Detailed Point-By-Point Lighting Calculation Plans for ALL Rooms contained in this Project. Point-By-Point Lighting Calculations must contain the following:
1) Room Name and Room Number.
2) Lighting Fixture Type for Each Light.
3) Footcandle Values shown at 30” AFF for Task Lighting and at 0” AFF for Egress Lighting and Exterior Lighting.
4) Statistics including max/min footcandles, average, and max-min ratio.
5) Note: Typical (same) rooms can have (1) calculation submitted, but must identify all of the room name and room numbers the calculation applies to so all rooms are covered.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp characteristics:
a. "USE ONLY" and include specific lamp type.

b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

2.3 LIGHT EMITTING DIODE (LED) FIXTURES

A. Housing: Rigid aluminum construction.

B. Finish: Visible surfaces. Powder coated paint or natural aluminum as specified in Light Fixture Schedule. Color and finish as selected by Architect. Concealed parts, (lamp holders, yokes, brackets, etc.) matte black.

C. Lamp Holder Housing: Cast aluminum with integral heat radiating fins to assure cool lamp base operation, with sufficient heat dissipation to meet device manufacturer's guidelines, certification programs, and test procedures for thermal management.

D. Off-State Power: Luminaires shall not draw power in the off state. Exception: Luminaires with integral occupancy, motion, photo-controls or individually addressable fixtures with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.

2.4 LED POWER SUPPLIES

A. Minimum Power Factor: 90%.

B. Minimum Operating Temperature: -20 degrees C.

C. Output Operating Frequency: 120 Hz minimum.

D. Power Supply:
1. Shall meet FCC requirements for non-consumer use.
2. Shall comply with IEEE C.62.41-1991, Class A operation.

E. Sound Rating: Class A.

2.5 LEDS

A. LED modules/arrays shall have a minimum CRI of 80 unless otherwise specified in the Light Fixture Schedule.

B. Color temperature variations shall not exceed +/- 100 degrees Kelvin at installation, and +/- 200 degrees Kelvin over the life of the module.

C. LED modules/arrays shall deliver at least 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours.

2.6 EXIT SIGNS

A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single or double as required for the installed location.
2. Directional Arrows: As required for the installed location.

2.7 LAMPS

A. All Lamps:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Owner's Representative to be inconsistent in perceived color temperature.

2.8 BALLASTS

A. Provide ballasts containing no polychlorinated biphenyls (PCBs).

B. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.9 POLES

A. Furnish products as indicated in the Light Fixture Schedule in the Drawings.

B. All Poles: Provide poles, associated support components suitable for the luminaire(s), associated supports and accessories to be installed.

C. Pole Foundations:
1. Pre-cast concrete. Refer to Drawings.
2. Manufacturer’s: Oldcastle Precast, or reviewed and approved Manufacturers.

2.10 LIGHTING STANDARDS

A. Pole/Luminaire Assemblies and Bollards: Supply luminaires, davit arms, brackets, poles, handhole covers, base components and all other accessories for a complete assembly. Manufacturer shall be responsible for proper fitting of all elements and the structural integrity of the unit. Provide assembly to withstand 100 mph steady wind rated poles with 1.3 gust factor.

B. Provide watertight insulating fuse and holder in the base of each lighting standard to individually protect each lighting fixture. Fuse holder similar to Buss style "HEX" (HEB permitted for 120V or 277V), with Buss fuse of appropriate ampacity and voltage. Provide fuse for each hot circuit wire; do not fuse neutral.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

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

D. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

E. Verify that suitable support frames are installed where required.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. Prior approval must be in writing. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:
1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:
1. Ceiling Mount:
2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.

5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 09 23 "Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 27 10 00

TELECOMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Horizontal Structured Cabling System Supporting:
   2. Telecommunications Rooms and Spaces
   3. Grounding and Bonding Infrastructure
   4. Backbone Connectivity and Cabling
   5. Manufacturer Certification
   6. General contract and installation requirements

B. Related Sections:
   1. Division 1 – Submittal Procedures
   2. Division 1 – Closeout Procedures
   3. 26 05 33 – Raceways and Boxes for Electrical Systems

C. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 1 specification sections apply to this Section.

D. Substitutions: The substitution of product shall not be considered under the terms and conditions of this section.

1.2 TELECOMMUNICATIONS INFRASTRUCTURE REQUIREMENTS

A. General:
   1. Provide all labor, materials, tools, equipment and services for the installation as indicated, in accordance with general provisions of the specifications and the contract drawings.
   2. Coordinate all work with all other trades for a complete and operational system. All telecom outlet back boxes shall be 5 square 2-7/8 inch deep. Provide T&B Steel City 82181T-1-114 or equal.
   3. Provide all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, whether or not specifically indicated in the contract documents.
   4. Provide all open cabling support systems
   5. Provide testing of horizontal and backbone copper and optical fiber connectivity and cabling infrastructure.
   6. Provide all project closeout documentation including but not limited to test result documentation, record drawings, manufacturer warranty applications and certificates and O&M manuals.
   7. Provide the installation of the owner furnished equipment including environmental monitoring units, wireless access point mounting hardware, wireless access points, wireless antennas where indicated on the drawings.

B. Provide complete installation of the telecommunications infrastructure including but not limited to:
   1. Pathways including open cabling supports
   2. Firestopping materials
   3. Horizontal and backbone copper connectivity and cabling
   4. Enhanced multimode optical fiber connectivity and cabling
   5. Equipment mounting racks, wall mount enclosures and server enclosures
   6. Horizontal and vertical cable management systems
   7. Telecommunications grounding and bonding systems
   8. Rack mount peripheral devices including equipment shelving, keyboard-mouse shelving, equipment support brackets, power strips with mounting hardware and UPSs with mounting hardware
   9. Copper and optical fiber modular patch cords
   10. Testing of the horizontal permanent link and backbone cabling systems
   11. Labeling and identification

C. Telecommunications contractor shall purchase all materials required to complete the work specified by this Section and in the Contract Drawings.

D. Work and materials not included:
   1. Wide Area Network equipment including routers, firewalls, modems and ASAs.
   2. Local Area Network equipment including hubs and switches.
   3. Wireless Local Area Network equipment including POE enabled switches and wireless controllers.
   4. Server hardware including application servers, Storage Area Network, application software and virtualization software.
   5. Desktop PC computing devices and equipment.

1.3 SUBMITTALS

A. Provide the number of copies of submittals required under the general provisions of these specifications. Submittals shall consist of neatly bound copies of catalog product cut-sheets, manufacturers' installation information, for all specified materials, assembled in accordance with the requirements of Division 1.

B. All submittals shall be submitted at one time to the Owner Representative for approval. Partial submittals will not be considered.

C. One copy of the submittals shall be kept at the job site.

D. Where manufacturer cut-sheets identify multiple products, provide an indicator for the correct product.

E. Telecommunications Pre-Construction Submittal:
   1. Provide electronic submittals in booklet style form, with data arranged under basic categories, i.e., Certifications, Personnel Training, Manufacturer Warranty, Products, Test Equipment and Calibration, etc.
   2. Submittal shall include a typewritten index.
   3. Submittal shall be organized by specification infrastructure component sections described within Part 1 and Part 2.
   4. Submittal shall include identifying pages between sections and references to section of the specifications.

5. Submit product data information sheets for approval and coordination with the item or model to be used clearly marked, showing ratings where appropriate.
6. Submittals shall be provided as one complete submittal. Partial submittals shall be rejected.
7. Provide sample labeling for each of the following telecommunications infrastructure components:
    a. Workstation device faceplate identification labeling; provide a label per telecommunications room
    b. 110 cross-connect block wall fields for both horizontal, intrabuilding and interbuilding backbone terminations
    c. Surface mount and rack mount fiber cabinets for both horizontal, intrabuilding and interbuilding backbone terminations
    d. Multi-pair copper intrabuilding and interbuilding backbone cabling identification tags
    e. Optical fiber intrabuilding and interbuilding backbone cabling identification tags

F. Recommendations, and other descriptive
1. Submit the network test equipment including model number and serial number. Provide proof of calibration by the manufacturer.
2. System Certification: Provide a certificate from the manufacturing company to identify the contractor is authorized to offer the extended and applications assurance warranty.
3. Submit the resumes and certifications of all technicians and the project manager who will support this project. The certifications shall include:
    a. Copper and optical fiber installation certification
    b. Approved manufacturer classes satisfactorily completed

G. Pathway Shop Drawings:
1. Submit shop drawings of telecommunications cabling pathway system and raceway to the Owner Representative. Contractor shall coordinate with other trades prior to the submittal and start of installation.
2. Drawings shall show exact routing of all horizontal cabling for workstation distribution throughout the building, as well as all intrabuilding and interbuilding copper and optical fiber backbone cabling.
3. Drawings shall identify quantity and size of all raceways, floor and wall penetrations and cable management equipment used to route and protect horizontal and backbone cabling.
4. Indicate pathway loading, and identify all cabling included in each pathway run by cable quantity. Individual cabling runs shall be indicated similarly.
5. Workstation devices shall be labeled to provide identification of cabling being terminated in the telecommunications rooms and spaces.
6. All pathway shop drawings shall be generated using AutoCAD®, Version 2017 or newer versions of software, or as approved by the Owner. Provide copy of AutoCAD shop drawings in PDF format for electronic submittals.
7. Work under this section has been indicated on the drawings in locations which should allow installation without interfering with the work of other trades; however, exact finish locations cannot be indicated. Therefore, locations of all work and equipment shall be verified to avoid

interferences, preserve head room and keep openings and passageways clear. Review the plans for the work of the other trades and coordinate adjustment of this work, the work of the other trade or both to achieve the best installation for the Owner without additional claims or charges. Shop Drawings shall reflect coordination of work under this Section with the work of other trades.

H. Test Reports:
1. Provide test reports no longer than five (5) days after the substantial completion date for the facility. Provide to the Owner's Representative an electronic copy of all test results, including the overall test summary report.
2. Provide test reports specific to wireless connections independent of the test reports for telecommunications or other IP based systems such as security CCTV camera systems.
3. Provide proof of calibration of the network test equipment and permanent link adapters.
4. Test results shall be provided in PDF format.
5. Include a final copy of the test reports in the O&M Manual.
6. A copy of the summary test sheets shall be provided in the O&M Manual.

I. Record Drawings:
1. A complete set of all telecommunications drawings shall be kept in the job-site office to show actual installation of cabling and equipment during construction.
2. The use of this set of drawings shall only be used for recording as-built conditions.
3. Where any material, equipment or system component is installed differently from that shown, the difference shall be indicated clearly and neatly using ink or indelible pencil in the color red during construction.
4. Ten (10) days after the substantial completion date for the facility, provide an electronic set of record drawings, incorporating all changes during construction. Submit the record drawings to the Owner's Representative for review and acceptance.
5. Record drawings shall be submitted in AutoCAD® Version 2017 or newer versions of software, Revit, or as approved by the Owner, and in PDF format. Architectural x-reference backgrounds shall be bound to each drawing file. Request the final architectural background drawing files that incorporate any floor plan and program spaces numbering modifications or other related information pertinent to the Owner.
6. Provide an electronic copy of the record drawings in full-size PDF and AutoCAD format, along with the O&M manual.

J. Provide closeout documentation to the Owner's Representative and Architect under provisions of Division 1 and this Section.

1.4 DEFINITIONS

A. Administration: the methodology defining the documentation requirements of a cabling system and its containment, the labeling of functional elements, and the process by which moves, additions, and changes are recorded

B. Bonding: the permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed

C. Cable: an assembly of one or more insulated conductors or optical fibers within an enveloping sheath

D. Cable run: a length of installed media, which may include other components along its path

E. Cabling: a system of cables, cords, and connecting hardware

F. Channel: the end-to-end transmission path between two points at which application-specific equipment is connected including test cords and patch cords for a maximum total distance of 328 feet (100 meters)

G. Connecting hardware: a device, or a combination of devices, used to connect cables or cable elements

H. Consolidation point: a location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways

I. Cross-connection: a connection scheme between cabling runs, subsystems, and equipment using patch cords or jumpers that attach to connecting hardware on each end

J. Demarcation point: a point where the operational control or ownership changes

K. Equipment room: an environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect

L. Ground: a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of earth

M. Horizontal cabling: distribution media that connect the telecommunications outlet/connector at the work area and the first piece of connecting hardware in the horizontal cross-connect

N. Horizontal cross-connect: a group of connectors that allows equipment and backbone cabling to be cross-connected with patch cords or jumpers

O. Infrastructure (telecommunications): a collection of those telecommunications components, excluding equipment, that together provides the basic support for the distribution of all information within a building or campus

P. Local area network (LAN): the standard industry term for a network installation that serves a relatively small area (e.g., structured cabling installation serving a building)

Q. Main cross-connect: the cross-connect normally located in the (main) equipment room (MDF) for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables

R. Modular jack: a female telecommunications connector that may be keyed or unkeyed and may have 6 or 8 contact positions

S. Outlet/connector (telecommunications): a connecting device in the work area on which a horizontal cable or outlet cable terminates

T. Patch cord: a length of cable with connectors on both ends used to join telecommunications circuits/links at the cross-connect

U. Patch panel: a connecting hardware system that facilitates cable terminations and cabling administration using patch cords

V. Pathway: a sequence of connections that provides the connectivity between devices on a network or between networks on an internetwork; the vertical and horizontal route of the telecommunications cable; a facility for the placement of telecommunications cabling

W. Permanent link: a test configuration for a link excluding test cords and patch cords for a maximum total distance of 295 feet (90 meters)

X. Plenum: a compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system

Y. Room, telecommunications: an enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling

Z. Star topology: a network topology in which services are distributed from or through a central point

AA. Telecommunications: any transmission, emission, and reception of signs, signals, writings, images, and sounds, that is information of any nature by cable, radio, optical, or other electromagnetic systems

BB. Unshielded twisted pair (UTP): cable made up of one or more pairs of twisted copper conductors with no metallic shielding; the entire assembly is covered with an insulating sheath (cable jacket)

CC. Wireless access point: a stand-alone hardware device or a computer wireless adapter with software that acts as a wireless communication hub for users of wireless devices to connect with each other and to bridge those devices to the cabled portion of the network

DD. Wide area network (WAN): a data communications system that uses telecommunications circuits to link LANs that are distributed over large geographic distances

EE. Wireless local area network (WLAN): using radio frequency technology, such networks transmit and receive data over the air, minimizing the need for wired connections; they combine data connectivity with user mobility

FF. Work area (workstation): a building space where the occupants interact with telecommunications terminal equipment

GG. Work area cable (cord): a cable connecting the telecommunications outlet/connector to the terminal equipment

1.5 REFERENCE CODES AND STANDARDS

A. Installation Standards: Cable and equipment installation shall comply with the following standards. All publications must be of the latest issue and addenda:
   1. NEC® 2020: National Electric Code®, 2020
   2. NESC® 2020: National Electric Safety Code®, 2020
   3. ANSI/TIA-568.0-E: Generic Telecommunications Cabling for Customer Premises (March 2020)
   4. ANSI/TIA-568.1-E: Commercial Building Telecommunications Cabling Standard Part 1: General Requirements (March 2020)

5. ANSI/TIA-568.2-D: Balanced Twisted-Pair Telecommunications Cabling and Components Standards (September 2018)
6. ANSI/TIA-568.3-D: Optical Fiber Cabling Components Standards (October 2016)
7. ANSI/TIA-569-E: Commercial Building Standard for Telecommunications Pathways and Spaces (May 2019)
8. ANSI/TIA-598-D: Optical Fiber Cable Color Coding (July 2014)
9. ANSI/TIA-606-C: The Administration Standard for the Telecommunications Infrastructure of Commercial Building (June 2017)
10. ANSI/TIA-J-STD-607-A: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (October 2002)
11. ANSI/TIA -758: Customer Owned Outside Plant Telecommunications Cabling Standard (March 2012)
12. ANSI/TIA/EIA-455-B: Standard Test Procedures for Fiber Optic Cables and Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components
13. ANSI/TIA-526-7-A: Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (July 2015)
14. ANSI/TIA-526-14-C: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant (April 2015)
15. ANSI/TIA-862-B: Building Automation Systems Cabling (February 2016)
16. ANSI/TIA-942-B: Telecommunications Infrastructure Standard for Data Centers (July 2017)
17. ANSI/TIA/EIA-604: Fiber Optic Connector Intermateability Standard
18. ANSI/TIA-472C000-B / ICEA S-83-596-2001: Fiber Optic Premises Distribution Cable (January 2005)
19. ANSI/TIA-472D000-B / ICEA S-87-640-2006: Fiber Optic Outside Plant Communications Cable (July 2007)
20. ANSI/TIA-472E000 / ICEA S-104-696-2003: Standard For Indoor-Outdoor Optical Cable (January 2005)
21. ANSI/TIA-492AAAC-B: Detail Specification for 850-nm Laser-Optimized, 50um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers (November 2009)
22. ANSI/TIA-492AAAB-A: Detail Specification for 50um Core Diameter/125um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers (November 2009)
23. ANSI/TIA-492AAAA-B: Detail Specification for 62.5um Core Diameter/125um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers (November 2009)
24. ANSI/TIA TSB-140: Additional Guidelines for Field-Testing, Loss and Polarity of Optical Fiber Cabling Systems (February 2004)
25. IEEE 802.3-2018: Ethernet Standard
26. IEEE 802.3af and 802.03at: Power-Over-Ethernet and Power-Over-Ethernet Plus Standard.
27. IEEE 802.11a,b,g,n: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification Standard.
28. ANSI/BICSI 001-2017: Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities
29. BICSI Information Transport Systems Installation Methods Manual, 7th Edition

30. BICSI Telecommunications Distribution Methods Manual, 14th Edition

B. Materials:
1. Where a Nationally Recognized Testing Laboratory (NRTL) listing or classification exists for a product and the product is suitable for the purpose specified and indicated, the product shall bear the appropriate marking indicating the listing or classification.
2. All materials shall be UL Listed and labels indicating so shall be affixed where labeling is normally visible.
3. Equipment shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
4. All telecommunications connectivity and cabling shall be independently tested to meet current TIA standards.

C. Codes:
1. Comply with the governing requirements indicated in this Section.

1.6 QUALIFICATIONS

A. The telecommunications work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for telecommunications work described in this Section shall be telecommunications contractors, who may be a division of the Division 26 Subcontractor.

B. Specialty Subcontractors bidding telecommunications work shall have a minimum of seven years' experience in the construction, testing, and servicing of systems of the type and magnitude specified herein. The Subcontractor shall have completed at least ten projects of equal or larger in size to this project within the past five years.

C. Telecommunications contractor shall be a certified installer of the telecommunications system, pre-qualified by the manufacturer for the purpose of offering the Applications Assurance warranty as required.

D. Telecommunications contractor shall have direct access to all tools and test equipment required to complete the telecommunications work when the work is bid.

E. Provide the names of the telecommunications contractor's personnel to be assigned to this project and the specific experience of each.

F. The telecommunications project manager (in office) and superintendent (field) shall have five years' experience at the project manager and superintendent levels, respectively, on completed telecommunications projects of like magnitude and complexity. The project manager shall have the certification of a Registered Communications Distribution Designer (RCDD) through Building Industry Consulting Service International (BICSI).

G. All field technicians who will work independently at any given time during the project on the structured cabling system shall have a minimum of one year experience on completed telecommunications projects of like magnitude and complexity. All field technicians working at the job site shall have completed a copper technician installation training class conducted by the warranting manufacturer or BICSI.

H. All field technicians who will work independently at any given time during the project on the optical fiber systems shall have a minimum of three years' experience on completed telecommunications projects of like magnitude and complexity. All field technicians working at the job site shall have completed an optical fiber technician installation training class conducted by the warranting manufacturer or BICSI.

1.7 REGULATORY REQUIREMENTS

A. All Work shall conform to the requirements of NFPA 70.

B. All Work shall conform to the requirements of all Federal, State and Local Electrical and Telecommunications Regulations.

1.8 PRE-CONSTRUCTION MEETINGS

A. The telecommunications contractor shall attend the pre-construction meeting as required by the general contractor or the Owner's Representative.

B. The telecommunications contractor shall attend a dedicated telecommunications pre-construction meeting, prior to the start of the installation, strategic to the scope of work in the contract documents at the sole request of the Owner, Owner's Representative or Consultant.

1.9 MANUFACTURER CERTIFICATION

A. The structured cabling system shall be covered by an Application Assurance Warranty.
   1. This warranty shall cover passive telecommunications infrastructure copper and optical fiber connectivity and cabling products and performance for a period of 25 years from date of installation registration, and will support any existing or future applications designed to operate over a 250 MHz horizontal channel as defined in the current ANSI/TIA-568-0-E, 1-E, 2-D standards.
   2. Installation practices shall follow the installation guidelines and procedures specified in the manufacturer certified installer training course and the current ANSI/TIA standards.
   3. Acceptable manufacturer partner is Ortronics / Superior Essex – nCompass System Warranty.
      a. Acceptable alternate manufacturer solution is Uniprise /CommScope - Extended Product Warranty.
      b. Acceptable alternate manufacturer solution is Leviton / Berk-Tek – Limited Lifetime System Warranty.
   4. Provide closeout documentation in accordance with the manufacturer warranty requirements to comply for acceptance of warranty. Documentation shall be submitted to the manufacturer including, but not limited to:
      a. Manufacturer warranty application form.
      b. Compliance of the proper network test equipment and permanent link adapters.
      c. Electronic test results per cable port and a summary report of all test results.
      d. Record drawings with identification labeling in PDF format.

e. All documentation shall be issued electronically on a stick drive, FTP site or via email.

5. Provide the manufacturer warranty application registration number to the Owner or Owner's Representative.

B. The telecommunications contractor shall provide the original hard copy certificate for the Application Assurance Warranty to the Owner.

1.10 MAINTENANCE

A. Deliver maintenance materials to the Owner under provisions of this section.

B. Modular Patch Cords, Category 6: Provide the following quantities, lengths and colors: Turn over to the Owner 21 days prior to substantial completion. Provide a signed transmittal to the Owner or Owner's Representative including each type of patch cord, quantity, length and color provided as part of the final acceptance.

1. Provide Ortronics Category 6, 4-pair, 23-gauge, lengths and colors as follows:

Length	Blue	White	Yellow	Black	Green
3-Foot	50	25	25	15	10
5-Foot	25	15	20	10	10
7-Foot	15	10	10	10	5
9-Foot	10	5	5	5	5

C. Optical Fiber Patch Cords: Provide the following types, lengths, quantities, and colors. Turnover to the Owner Representative 21 days prior to substantial completion.

1. Provide Ortronics: Optical fiber shall be a tight buffered duplex multimode cable, 50/125 micron, in the color aqua.

Length	Quantity	Color
1- Meter	15	Aqua
2- Meter	10	Aqua
3- Meter	5	Aqua

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS ROOMS AND SPACES

A. Fire Retardant Plywood Backboards:

1. Provide 3/4" x 8' high fire retardant ACX plywood backboard to cover walls as shown on drawings. Backboard shall bear a seal identifying that plywood is fire-rated.
2. Backboard shall be finished with flat latex, white anti-static sealer or overcoat paint. Paint plywood backboard on all sides and edges prior to mounting on walls. Area around fire retardant seal shall be unpainted so that seal remains exposed and visible.
3. Backboard shall be mounted at +6-inches above finished floor.
4. Install plywood backboard in full sheets, C-side exposed, butting top edge of backboard to ceiling. Secure studs with screws nominally every 24-inches of vertical spacing.

B. Grounding and Bonding:

1. Pipe Clamps:

a. Copper UL listed grounding connector with pre-drilled lug pad allowing 2-hold compression terminal; the size of connector will be dictated by pipe size.
b. Manufacturer is Burndy GAR-TC series or approved equivalent.

2. Communication Grounding Rods:
   a. Copper-clad steel, 5/8" x 8' long; provide ground connector:
   b. Manufacturer is Burndy GAR series, T&B GUV series, or approved equal.
3. Telecommunications Bonding Backbone (TBB): Telecommunications Bonding Backbone conductors shall be #3/0 AWG stranded insulated copper conductor, unless otherwise noted.
4. Exothermic Welding:
   a. Cadweld or Thermoweld; appropriate fittings as required.
5. Telecommunications Main Grounding Busbar (TMGB):
   a. TMGB shall be a copper plate, 1/4" thick x 4" wide x 20" long conforming to BICSI and ANSI/TIA standards.
   b. TMGB shall be pre-drilled for bolts to secure bar to insulating standoffs. Mounting holes shall be 3/8" diameter spaced 5.75" apart. TMGB shall include insulators to isolate busbars from the wall or other mounting surfaces.
   c. Busbar shall be pre-drilled with hole pattern to accommodate two-hole lugs as follows, (27) lugs with 5/8" hole centers and (3) lugs, 1" hole centers.
   d. Manufacturer is CPI, Part No. 40153-020.
6. Telecommunications Grounding Busbar (TGB):
   a. TGB shall be a copper plate, 1/4" thick x 4" wide x 10" long conforming to BICSI and ANSI/TIA standards.
   b. TGB shall be pre-drilled for bolts to secure bar to insulating standoffs. Mounting holes shall be 3/8" diameter spaced 5.75" apart. TGB shall include insulators to isolate busbars from the wall or other mounting surfaces.
   c. Busbar shall be pre-drilled with hole pattern to accommodate two-hole lugs as follows, (4) lugs with 5/8" hole centers and (3) lugs, 1" hole centers.
   d. Manufacturer is CPI, Part No. 13622-010
7. Provide C-type compression taps to bond together two or more bonding backbones.
   a. Manufacturer: Burndy YGHC series, or approved equivalent.
8. Cable Terminals:
   a. Cable terminal shall be two-hole, non-insulated copper compression long barrel terminal, requiring 3/8" bolts on 1" and 5/8" centers.
   b. Manufacturer: Burndy YA-2TC series, T&B 256-30695 series, or approved equivalent.

C. Peripheral Devices for Equipment Racks
1. Each equipment rack shall be equipped with the following equipment. Quantities shall be determined from applicable drawings and material parts lists.
   a. Manufacturer is Ortronics or approved equal:
      1) 19" wide equipment shelf, Part No. OR-60400006

2) 19” wide heavy-duty equipment shelf, Part No. OR-60400355
3) Equipment mounting screws, provide 5 packages of screws for each telecommunications room, Part No. OR-60400005 (4 screws per package)
4) Rear equipment support bracket, Part No. OR-60400383
5) Grounding kit, Part No. OR-60400010

b. Vertical Power Strip
1) Provide 49” vertically mounted power strip with (16) NEMA 5-20R receptacles and standard plug. Manufacturer is Ortronics, Part No. OR-60400681

c. Each free standing equipment rack shall be secured to the concrete floor with a concrete floor mounting kit. Manufacturer is CPI, Part No. 40604-001

D. Cable Management
1. Wall Mounted Cable Management
a. 110 Jumper Troughs
1) Provide horizontal cable management, jumper trough with legs, mounted above and below each 100-pair or 300-pair 110 wiring block kit.
2) Manufacturer is Ortronics, Part No. OR-30200140
3) Provide D-rings, as indicated on applicable drawings, for routing and managing cabling on backboards.
a) 4” D-ring, Siemon Part No. S144
b) 6” D-ring, Siemon Part No. S146

E. Wall Mount Enclosure
1. Enclosure shall be dual hinge style wall mountable with dimensions of 24-inch width and 26-inch depth and shall be capable of supporting up to 150 lbs. of equipment. The height of the cabinet will be dependent upon the quantity of rack units required as indicated on the contract drawings.
2. Enclosure shall have four adjustable #12-24 tapped EIA mounting rails and shall provide [12, 19 or 26] rack units of mounting space for 19” equipment.
3. Enclosure shall be equipped with a lockable safety plexiglass front door in the color smoke black, cable entry brushes, and vertical cable management rings.
4. Provide cabinet with optional cooling fans.
5. Passive ventilation grilles shall be located on the top, bottom and sides.
6. Provide brush plate kits and install on the top and bottom section of the enclosure to facilitate the connection to surface mount raceways.
7. Position enclosure and associated hinged side as indicated on the contract drawings.
8. Manufacturer is Ortronics:
a. 12 rack unit enclosure (23.5” height), Part No. OR-MMW122426P-B
b. 19 rack unit enclosure (35.75” height), Part No. OR-MMW192426P-B
c. 26 rack unit enclosure (48” height), Part No. OR-MMW262426P-B
d. Bush Plate Kit, Part No. OR-VWMBGK
e. Fan Kit, Part No. OR-VWMFK-115

F. Patch Panels
1. Category 6 Modular Patch Panels (Horizontal Copper Cable Termination)
   a. Category 6, 8-Position 8-Conductor module, non-keyed, dual reactance technology, 110 type printed circuit board style patch panels, universal T568A/B, wired in accordance with the T568B pin configuration standard and used to terminate UTP cables as specified herein. Patch panels shall be high density, 6-port modules, panel thickness at .125" aluminum with black powder coat finish; module shall be high impact plastic housing, flame retardant UL 94V-O, and fully encased protected printed circuitry. Modular contacts shall be beryllium copper, nickel under plating, 50 micro-inches of gold in contact area with IDC contacts phosphor bronze, nickel under plating with tin lead over plate, serving 22 through 24 AWG.
   b. Provide quantities and port configurations as indicated on the applicable contract drawings.
   c. Manufacturer is Ortronics:
      1) 24 port patch panel, Part No. OR-PHD66U24
      2) 48 port patch panel, Part No. OR-PHD66U48
2. Category 6 Modular Patch Panels (Backbone Copper Cable Termination)
   a. Category 6, 8-Position 8-Conductor module, non-keyed, dual reactance technology, 110 type printed circuit board style patch panels, universal T568A/B, wired in accordance with the T568B pin configuration standard and used to terminate UTP cables as specified herein. Patch panels shall be high density, 6-port modules, panel thickness at .125" aluminum with black powder coat finish; module shall be high impact plastic housing, flame retardant UL 94V-O, and fully encased protected printed circuitry. Modular contacts shall be beryllium copper, nickel under plating, 50 micro-inches of gold in contact area with IDC contacts phosphor bronze, nickel under plating with tin lead over plate, serving 22 through 24 AWG.
   b. Provide quantities and port configurations as indicated on the applicable contract drawings.
   c. Manufacturer is Ortronics:
      1) 24 port patch panel, Part No. OR-PHD66U24
      2) 48 port patch panel, Part No. OR-PHD66U48

G. Wall Mount 110 Series Wiring Block – Copper Cabling
1. Provide 100-pair wall mount wiring block kits, as indicated on applicable drawings, for terminating 100 ohm twisted pair horizontal and/or backbone cabling on plywood backboards.
2. 110 wiring blocks shall be constructed of high impact fire retardant polycarbonate UL 94V-O molded plastic and shall contain extension legs.
3. IDC contacts shall be phosphor bronze, 90/10 tin lead plating.
4. Each kit shall include white horizontal identification strips that secure and organize 25 pairs each.
5. The wiring blocks shall accommodate 22 through 26 AWG cable conductor size.
6. Manufacturer is Ortronics:
   a. 100-pair 110 block for backbone cabling, Part No. OR-30203506

H. 110 Series Wiring Block - Rack Mount Panel Kit
1. Provide rack mounted 110 block kit where indicated on contract drawings.
2. Kit shall include two 100-pair 110 wiring blocks and two jumper troughs on a 19" wide rack mountable panel and the associated 110C4 and/or 110C5 connecting clips. Backbone cabling shall utilize a combination of 4-pair 110C connecting clips for the first twenty pairs in a row and the last 5 pairs shall utilize a 5-pair 110C connecting clip.
   a. Manufacturer is Ortronics:
      1) Category 6 (2) 100-pair 110 blocks, Part No. OR-302003282

I. Provide identification strips for 110 wiring blocks and indicate color per TIA/EIA standards:
1. Manufacturer is Ortronics:
   a. Part No. OR-70400271

J. Optical Fiber Connectivity
1. Optical Fiber Fan Out Kits
   a. Provide 250 micron buffer tube fan-out kits, color-coded in lengths of 25.0 inches.
   b. Manufacturer is Corning:
      1) 6-Fiber Fan Out Kit, Part No. FAN-BT25-06
      2) 12-Fiber fan Out Kit, Part No. FAN-BT25-12
2. Optical Fiber Cabinets and Fiber Adapter Panels
   a. The optical fiber cabinet is a termination and administration point for the optical fiber cables in the network. The cabinet shall protect the connectorized optical fiber from mechanical stress, macro-bending loss at the connection point and tampering with the circuits. The cabinet shall provide a place for circuit identification.
   b. Surface Mount Fiber Cabinets (SMFC)
      1) The SMFC shall provide cross-connect and inter-connect capabilities and include support hardware to properly terminate and route the optical fiber strands and patch cords in a wall field.
      2) The SMFC shall have connector panels or adapters that can snap into the side of the interior vertical panel and accommodate optical fiber connectors.
      3) The SMFC shall provide terminating, cross connecting or interconnecting capability of 12 to 48 optical fiber strands. The units may be stacked to provide additional fiber termination capacity.
      4) The SMFC shall be made heavy constructed 18 gauge laser cut steel and shall be lockable on one side for additional security.
      5) Manufacturer is Ortronics:
         a) Two adapter SMFC with lock, Part No. OR-615SMFC-LX-12P
   c. Rack Mount Fiber Cabinets (RMFC)
      1) The RMFC shall provide terminating capability of 18 to 288 optical fiber strands.

2) The RMFC shall be stackable, wall or rack mountable depending on the location requirement. The cabinets shall fit into either 19" or 23" frame arrangements and shall be one, two or four rack units in height.
3) The RMFC shall consist of an enclosure with front and rear access and can be fully administered from the front or rear.
4) The RMFC shall have a clear, translucent, hinged plexiglass door in the front with a dedicated locking mechanism and the rear door shall be a solid metallic cover.
5) The RMFC shall be capable of only providing patching or shall be capable of providing both patching and splicing within the same cabinet.
6) Manufacturer is Ortronics:
   a) One rack unit, patching, 18-72 fiber capacity, Part No. OR-FC01U-P
   b) Two rack units, patching, 36-144 fiber capacity, Part No. OR-FC02U-P
   c) Four rack units, patching, 72-288 fiber capacity, Part No. OR-FC04U-P

d. Optical Fiber Adapter Panels
1) Optical fiber adapter panels shall be located within surface mount and rack mount fiber cabinets. Panels shall securing lock into open positions with the patching frames. Panels shall have plunger / grommet fasteners.
2) Optical fiber adapter panels shall consist of SC or LC connector type and shall be configured in either simplex or duplex connector arrangements.
3) 50μm multimode optical fiber connectors shall be color aqua and 62.5μm multimode optical fiber connections shall be in the color beige (62.5 shall be for existing conditions only)
4) Within the adapter panels, multimode optical fiber connectors shall have phosphor-bronze alignment sleeves and singlemode optical fiber connectors shall have ceramic alignment sleeves.
5) Within existing facilities that utilize ST connector types configured in a simplex connector arrangement with 6-ST connectors per panel, match the existing configuration and arrangement.
6) All unfilled positions within the fiber cabinets shall contain blank panels.
7) Manufacturer is Ortronics:
   a) Blank adapter panel, Part No. OR-OFP-BLANK
   b) 3-Duplex SC with designation strip, 50μm multimode, Part No. OR-OFP-SCD06LC
   c) 6-Duplex SC 50μm multimode, Part No. OR-OFP-SCD12LC
   d) 3-Duplex SC with designation strip, 62.5μm multimode, Part No. OR-OFP-SCD06MB

e) 6-Duplex LC 50μm multimode, Part No. OR-OFP-LCD12LC
f) 6-ST multimode, Part No. OR-OFP-STS06NB

3. Optical Fiber Cable Connectors
   a. Optical Fiber Cable Connectors - Multimode:
      1) Provide field installable multimode connectors to terminate optical fiber cables from cable-to-cable, cable-to-equipment or equipment-to-equipment. Multimode connector shall contain a factory bonded fiber strand insert, ceramic ferrule and factory polished.
      2) The connector shall be capable of mounting on either 0.9 mm-buffered fiber or 3.0 mm cordage. The connector shall meet EIA and IEC standards for respectability and have a locking feature to the coupler and assure non-optical disconnect.
      3) Insertion loss shall be 0.3 dB per multimode connector.
      4) 62.5 μm multimode connectors shall be identified with the color beige and the connector strain relief boot shall be the color black
      5) 50 μm multimode connectors shall be identified with the color aqua and the connector strain relief boot shall be the color black.
      6) Manufacturer is Ortronics:
         a) SC straight tip, Part No. OR-205KAN9FA-MM
         b) LC straight tip, Part No. OR-205KAN9GA-MM
         c) ST straight tip, Part No. OR-205KAN9EA-MM
4. Maxcell Textile Innerduct
   a. Provide flexible, polyester/nylon textile resin polymer fabric Maxcell innerduct in 2-inch, 3-inch or 4-inch widths in the standard product configuration. Innerduct shall contain multiple cells per innerduct as indicated on the construction drawings. Innerducts shall be installed within conduit raceways. Innerduct cells shall be the color white and shall have footage markers indicated on the side of the cell.
   b. Provide different thread identification color for each size of innerduct.
   c. Each cell within the Maxcell innerduct shall contain a pull tape in differentiating colors. One cell shall have a pull tape in the color white, a second cell shall have a pull tape in the color white with a blue stripe and the third cell shall have a pull tape in the color white with an orange stripe.
      1) Manufacturer is Maxcell:
         a) 2-inch, 2 cell with the color black spine, Part No. MXE52223BK
         b) 3-inch, 3 cell with the color blue spine, Part No. MXE64283BL
         c) 4-inch, 3 cell with the color red spine, Part No. MXE86383RD
   d. Provide Maxcell ball bearing installation swivel when installing innerduct. Utilize a 2500 lbs. swivel device.

1) Manufacturer is Maxcell:
a) Single 2500 lbs. swivel, Part No. MXCIK11

e. Provide Maxcell innerduct self-inflating termination bags for each conduit that has Maxcell innerduct and associated interbuilding backbone cabling consisting of either copper, optical fiber or both. Termination bags shall be provided in each service entrance conduit at the last maintenance hole that routes to either the associated telecommunications room or the exterior junction box on the building or structure. The termination bags shall also be provided at the opposite end at the telecommunications room or the exterior junction box.
1) Manufacturer is Maxcell:
a) 2-inch Self Inflating Sealing Bags, Part No. MXCB2
b) 3-inch Self Inflating Sealing Bags, Part No. MXCB3
c) 4-inch Self Inflating Sealing Bags, Part No. MXCB4

5. Optical Fiber Flexible Plastic Innerduct
a. Flexible duct/innerduct shall be UL listed UL 2024 with pull tape. Nominal O.D. shall be 1.65/1.66, I.D. 1.38/1¼", in the color orange or white
1) Manufacturer is Carlon:
a) Plenum-Gard, Part No. CG4X1C
b) Riser-Gard, Part No. DG4X1C
2) Contractor shall provide written evidence of UL 2024 listing.
3) Provide flexible duct/innerduct for all optical fiber cabling routed in open cabling pathways and backbone riser applications.

2.2 OPEN CABLING & DEVICE MOUNTING SUPPORTS

A. J-Hooks for Horizontal and Backbone Cabling
1. J-hooks shall comply with TIA requirements for structured cabling systems and pathway supports. Galvanized finish. Provide all hardware and hanger rod supports necessary for secure mounting to the structure. Follow manufacturer's recommendations for quantity of cables supported. Provide j-hook size as required for cables to be supported plus 25% spare capacity.
2. Manufacturer is Erico Caddy:
a. J-Hook Support, Part No. 1-inch CAT16HP, 2-inch CAT32HP, 3-inch CAT48HP, 4-inch CAT64HP

B. Adjustable Cable Support shall comply with TIA requirements for structured cabling system. The following are the maximum number of cables per category that shall be authorized to route within a single pathway of adjustable cable supports: Category 6 – 144 cables.
1. Erico Caddy Part No. CAT425.

C. Provide all accessories and mounting hardware required for a complete and working installation of open cabling supports.

D. Provide conduit waterfalls at the end of 4-inch conduits and conduit sleeves installed horizontally where the pathways transition from conduit to open cabling methods. Provide waterfalls on all conduits unless otherwise noted on the

contract drawings. Waterfalls shall be utilized to provide bend radius of all horizontal and backbone cabling. Waterfalls shall be UL Listed and rated for UL 94V-0. Material shall be glass reinforced flame retardant nylon 6.6.

1. Panduit Part No. CWF400

E. All tie wraps installed in the plenum spaces shall be plenum rated.

1. Panduit Part No. PLT2S-C702Y

2.3 FIRE-RATED PATHWAY DEVICE

A. Where shown on the contract drawings or based upon the number of horizontal and backbone cables, provide a self-contained fire-rated pathway device for routing telecommunications cabling through fire-rated walls. The fire-rated pathway device shall consist of a corrugated steel tube with zinc coating, contain an inner plastic housing, intumescent material rings and tightly twisted inner fabric smoke seal. The intumescent firestopping material shall automatically adjust to the size of the cabling bundle and shall permit cabling to be added or removed without the need to remove the firestopping material through the adjustment of the flanges and device threads at the ends of each sleeve. After the installation of the cabling, twist the inner fabric smoke seal so that it seals around the cabling. The length of the sleeve shall be 12.4 inches. The pathway device shall be UL tested and classified in accordance with ASTM E814 (UL1479). The following are the maximum number of cables per category that shall be authorized to route within a single 2-inch sleeve: Category 6 – 24 cables. The following are the maximum number of cables per category that shall be authorized to route within a 4-inch sleeve: Category 6 – 96 cables.

1. Manufacturer is HILTI Speed Sleeve series:
   a. 2-Inch Fire-Rated Pathway Device, Part No. CP 653 2” #2097882
   b. 4-Inch Fire-Rated Pathway Device, Part No. CP 653 4” #2097883

2.4 COPPER HORIZONTAL CABLING

A. Category 6 UTP copper cabling for interior spaces

1. Each horizontal cable shall be constructed from [23 AWG FEP (plenum)] or [24 AWG PE (non-plenum)] insulated solid bare copper conductors formed into four individually twisted pairs with a cross-filler center spline and enclosed by a [PVC thermoplastic flame-retardant (non-plenum)] or [fluoropolymer (plenum)] jacket in the color blue for data networks and in the color yellow for wireless, security and IP camera networks. Cable shall be [UL910, NFPA 262, CMP (plenum)] or [UL1666, IEC332-1, CMR (riser)] rated unless otherwise noted.
2. Cable diameter shall not exceed 0.22 inches.
3. Each conductor shall have an impedance of 100Ω ±15% / 100m.
4. Each cable shall meet the most current technical characteristics of ANSI/TIA-568.0-E, 568.1-E, 568.2-D standard.
5. Manufacturer is Superior Essex DataGain 6+ Series:
   a. CMP Plenum in the color yellow, Part No. 66-240-6B
   b. CMP Plenum in the color blue, Part No. 66-240-2B
   c. CMR Riser in the color yellow, Part No. 66-240-6A
   d. CMR Riser in the color blue, Part No. 66-240-2A

B. Category 6 UTP horizontal cabling for underground and exterior spaces

1. Each horizontal cable shall be constructed from 23 AWG insulated solid bare copper conductors formed into four individually twisted pairs with a cross-filler center spline. Cable shall be fully water blocked and enclosed by a UV resistant polyolefin jacket black in color.
2. Cabling shall be utilized per the NEC for use where pathways are routed within or below building slabs and foundations, in outside plant underground pathways and for aerial applications.
3. Cable diameter shall not exceed 0.275 inches.
4. Each conductor shall have an impedance of 100Ω ±15% / 100m.
5. Each cable shall meet the most current technical characteristics of ANSI/TIA-568.0-E, 568.1-E, 568.2-D standard.
6. Manufacturer shall be Mohawk-VersaLAN Indoor/Outdoor Cable, Part No. M58772

2.5 INTRA-BUILDING COPPER BACKBONE CABLING

A. Intra-building copper backbone cables shall be Category 6 UTP 4-pair cables. Provide quantities as shown on the drawings.
1. Provide Category 6 UTP 4-pair copper cables for the intra-building backbone infrastructure between the cross-connect patch panels or the 110 cross-connect blocks as indicated on the drawings. Each horizontal cable shall be constructed from [23 AWG FEP (plenum)] or [24 AWG PE (non-plenum)] insulated solid bare copper conductors formed into four individually twisted pairs with a cross-filler center spline and enclosed by a [PVC thermoplastic flame-retardant (non-plenum)] or [fluoropolymer (plenum)] jacket. Cable shall be [UL910, NFPA 262, CMP (plenum)] or [UL1666, IEC332-1, CMR (riser)] rated unless otherwise noted. Provide backbone cable with white jacket.
2. Manufacturer is Superior Essex DataGain 6+ Series:
   a. CMP Plenum in the color white, Part No. 66-240-4B
   b. CMP Riser in the color white, Part No. 66-240-4A

B. Optical Fiber
1. Intrabuilding 62.5/125 μm multimode optical fiber backbone cabling shall be a tight buffered premise distribution cable with 900 um buffered fibers surrounded by dielectric aramid yarns. Cable shall have an overall orange color jacket and shall meet the following standards: ANSI/EIA/TIA-568.3-D Telcordia GR-409; ICEA S-83-596; [OFNR/FT4 (riser)] or [OFNP/FT6 (plenum)].
   a. Manufacturer is Superior Essex:
      1) 6-Strand Plenum, Part No. 440066G01
      2) 12-Strand Plenum, Part No. 440126G01
      3) 6-Strand Riser, Part No. 430066G01
      4) 12-Strand Riser, Part No. 430126G01
   b. [62.5/125 μm multimode optical fiber backbone cabling should only be utilized if indicated on the drawings. Standard optical fiber cabling shall be 50/125 multimode.]
2. Intrabuilding 50/125 μm multimode optical fiber backbone cabling shall be a tight buffered premise distribution cable with 900 um buffered fibers surrounded by dielectric aramid yarns. Cable shall have an overall aqua color jacket and shall meet the following standards: ANSI/EIA/TIA-568.3-

D; Telcordia GR-409; ICEA S-83-596; UL; and [OFNR/FT4 (riser)] or [OFNP/FT6 (plenum)].

a. Manufacturer is Superior Essex:
   1) 6-Strand Plenum, Part No. 44006NG01
   2) 12-Strand Plenum, Part No. 44012NG01
   3) 6-Strand Riser, Part No. 43006NG01
   4) 12-Strand Riser, Part No. 43012NG01

2.6 TELECOMMUNICATIONS WORKSTATION DEVICES

A. Where indicated on drawings, telecommunications modules shall share a common faceplate. All four pairs of the UTP cable shall be terminated on each RJ45 module.

B. Category 6 Modules
1. 8-Position 8-Conductor modules shall be Category 6, dual reactance technology, non-keyed, universal T568A/B, wired in accordance with the T568B pin configuration standard and used to terminate Category 6 UTP cables as specified herein. Module shall be high impact plastic housing, flame retardant UL 94V-O, modular contacts shall be beryllium copper, nickel plating under 50 micro-inches gold plating in contact area. IDC contacts shall be phosphor bronze, nickel under plating with tin lead over plate serving 22 through 24 AWG. Category 6 modules shall be in the color fog white and blank modules shall be in the color fog white unless otherwise specified for specific locations and applications. Provide colored icons on each module.
   a. Manufacturer is Ortronics:
      1) Category 6 module
         a) Color fog white, Part No. OR-TJ600
      2) Blank module in package of 10
         a) Color fog white, Part No. OR-42100002
2. Provide Wiremold Ivory color, Category 6, RJ-45 modules and blank modules for installation of modules in Wiremold V-2400, V-4000 and V-6000 series raceway.
   a. Manufacturer is Ortronics:
      1) Category 6 module, Part No. OR-TJ600-99
      2) Blank module (pkg. of 10), Part No. OR-42100002-99

C. Flush Mounted Outlets
1. Faceplate
   a. Faceplate shall be single gang or dual gang thermoplastic to hold four, six or eight RJ45 modules.
   b. Faceplate shall be fog white in color for thermoplastic style.
   c. Faceplate shall be single gang stainless steel manufactured to hold two RJ45 modules for IP CCTV camera security networks and wireless networks. Stainless steel faceplates shall be utilized where devices are wall mounted and exposed to the public or installed above the ceiling space.
   d. Faceplate shall have recessed designation strips with clear plastic covers for both thermoplastic and stainless steel in accordance with the ANSI/TIA-606-B labeling standard.
   e. Manufacturer is Ortronics:
      1) 4-port single gang thermoplastic, Part No. OR-40300546

2) 8-port dual gang thermoplastic, Part No. OR-40300554
3) 2-port stainless steel, Part No. OR-403STJ12

D. Surface Mounted Outlet Boxes
1. Surface mounted outlet boxes shall be a single gang plastic box with a 2.0-inch depth.
2. Outlet box shall be fog white in color.
3. Manufacturer is Ortronics, Part No. OR-40300185

E. Surface Mount Interface Boxes
1. Surface mount interface boxes shall be thermoplastic base-plate with snap-on cover with capacity to hold two or four RJ45 modules.
2. Interface box shall be fog white in color.
3. Manufacturer is Ortronics:
   a. 2-port interface box, Part No. OR-404TJ2
   b. 4-port interface box, Part No. OR-404TJ2X2

F. Wiremold Surface Mount Raceway Bezel:
1. Wiremold raceway bezel shall be thermoplastic manufactured to hold four or six RJ45 modules and shall utilize a color that matches the surface mount raceway. Bezel shall integrate with the Wiremold V4050 bracket. Default color shall be Wiremold ivory.
2. Manufacturer is Wiremold:
   a. Device mounting bracket, Part No. V4050
   b. Device mounting bracket blank module, Part No. 5507B
   c. 4-port faceplate, Part No. 5507-4TJ
   d. 6-port faceplate, Part No. 5507-6TJ

G. Wireless LAN, BAS, Security & Fire Alarm Connectivity
1. Surface Mount Interface Boxes
   a. Where shown on drawings, provide surface mount interface box for interconnection of wireless access points devices, Security, Fire Alarm and mechanical controller connections within the structured cabling infrastructure.
   b. Surface mount interface boxes shall be thermoplastic base-plate with snap-on cover with capacity to hold two RJ45 modules.
   c. For wireless LAN access points, Security, Fire Alarm and mechanical controller connections, thermoplastic interface boxes shall be utilized for non-plenum applications only. For plenum applications, provide a single gang metallic outlet box with a single gang stainless steel faceplate.
   d. Outlet box shall be fog white in color.
   e. Manufacturer is Ortronics, Part No. OR-404TJ2

H. Identification Icons
1. Voice icons shall be in the color white.
2. Data icons shall be in the color blue.
3. Wireless access point and IP camera data icons shall be in the color yellow.
4. Icons shall be mounted on each RJ45 module and on each associated patch panel port in the telecommunications rooms.
5. Manufacturer is Ortronics:
   a. Voice icon, color white, Part No. OR-40309100
   b. Data icon, color blue, Part No. OR-40326200

c. Data icon, color yellow, Part No. OR-40324200

2.7 PATCH CORDS

A. Furnish quantities modular and optical fiber patch cords of color and length as indicated in Section 1.9.

B. Copper
1. Category 6 Patch Cords
a. Patch cords shall be constructed from Category 6 4-pair 24 AWG, stranded patch cable material.
b. Patch cord cable assembly shall be UL® listed.
c. Patch cords cable shall meet FCC Part 65 plug and termination.
d. Manufacturer is Ortronics:
1) Part No. OR-MC6xx-yy; where xx = length and yy = color
2) Colors shall be -00 for black, -04 for yellow, -05 for green, -06 for blue, –09 for white

C. Optical Fiber Patch Cords
1. Optical fiber patch cords shall be constructed from OFNR rated dual fiber cordage.
2. Optical fiber patch cords shall be LC-LC or SC-SC 50 μm (multimode) fibers.
3. Optical fiber patch cords shall be assembled with ceramic ferrule metal ferrule (multimode) connectors as indicated in Section 1.10, Maintenance.
a. Manufacturer is Ortronics:
1) 50 μm multimode, LC-LC: Part No. OR-P3DF8LPAZAZ00zM; where z = length in meters
2) 50 μm multimode, SC-SC: Part No. OR-P3DF2LRFZFZ00zM; where z = length in meters

D. Verify exact connector type with owner and engineers prior to ordering.

E. Contractor shall provide storage for patch cords in the telecommunications rooms.

2.8 BACKBONE CABLING IDENTIFICATION TAGS

A. Copper and optical fiber identification tags shall be self-laminating, write-on, rigid, non-adhesive, measuring 3.50” x 2.00”, and with a vinyl material strength of 0.20”. Attach the tags to the associated innerduct or directly to the cabling utilizing specified cable ties. The legend and nomenclature for optical fiber cabling shall read “CAUTION: FIBER OPTIC CABLE” and for copper cabling shall read “CAUTION: COPPER BACKBONE CABLE”. Each tag shall have sub attribute lines for “TYPE” and “COUNT”. The tag color for optical fiber cabling shall be yellow and the tag color copper cabling shall be orange.
1. Manufacturer is ACP International:
a. Optical fiber cabling tags, Part No.: VCT-200 (yellow).
b. Copper cabling tags, Part No. VCT-201 (orange)
c. Cable tie shall be dome-top, barb type with stainless steel locking barb, material shall be Nylon 6.6 with a maximum width of .141”.
1) Manufacturer is Panduit:
a) 6.1” length, Part No. BT1.51-C
b) 8.0” length, Part No. BT21-C

2.9 WIRELESS AND SECURITY IP-ENABLED CONNECTIVITY AND HARDWARE

A. Wireless Access Points Connectivity and Cabling
1. Category 6 UTP cabling premise
2. Each horizontal cable shall be constructed from [23 AWG FEP (plenum)] or [24 AWG PE (non-plenum)] insulated solid bare copper conductors formed into four individually twisted pairs with a crossfiller center spline and enclosed by a [PVC thermoplastic flame-retardant (non-plenum)] or [fluoropolymer (plenum)] jacket in the color orange. Cable shall be [UL910, NFPA 262, CMP (plenum)] or [UL1666, IEC332-1, CMR (riser)] rated unless otherwise noted.
a. Cable diameter shall not exceed 0.22 inches.
b. Each conductor shall have an impedance of 100Ω ±10% / 100m.
c. Cabling shall be terminated to a 2-port Surface Mount Interface Box as noted herein with a patch cord connection to the device.
d. Each cable shall meet the most current technical characteristics of ANSI/TIA-568-C standard.
e. Manufacturer is Superior Essex, DataGain 6+Series:
1) CMP Plenum in the color yellow, Part No. 66-240-6B
2) CMR Riser in the color yellow, Part No. 66-240-6A
3. Category 6 UTP cabling outside plant
a. Each horizontal cable shall be constructed from 23 AWG insulated solid bare copper conductors formed into four individually twisted pairs with a crossfiller center spline and enclosed by a UV resistant polyethylene in the color black. Cable shall contain a gel-filled water resistant flooding compound.
b. Cable diameter shall not exceed 0.275 inches.
c. Each conductor shall have an impedance of 100Ω ±10% / 100m.
d. Cabling shall be terminated to a 2-port Surface Mount Interface Box as noted herein with a patch cord connection to the device.
e. Each cable shall meet the most current technical characteristics of ANSI/TIA-568-C standard.
f. Manufacturer shall be Mohawk-VersaLAN Indoor/Outdoor Cable, Part No. M58772

PART 3 - EXECUTION

3.1 GENERAL

A. Provide suitable barriers and take any other safety precautions required by applicable codes.

B. The working area shall be kept free from debris of all types and remove all rubbish resulting from their work on the premises. Upon completion, vacuum and clean room floors, equipment racks, enclosures and cable management where work has been performed.

C. Telecommunications contractor shall be responsible for any building repairs made necessary by their work or caused by negligence of their employees. No cutting, notching, drilling or altering of any kind shall be done to the building without first obtaining permission from the Owner.

D. The Owner may have other contracts in connection with this work for the installation of software and equipment for data, voice, wireless, video or audio-visual applications. Telecommunications contractor shall provide other Trade Contractors reasonable opportunity for the introduction and execution of their work and shall properly coordinate other trade's work with theirs as required.

E. Provide all patch panels and blocks shown on the telecommunications drawings whether or not they are fully populated with cables.

F. Provide all cables, devices and equipment racking systems as shown on the contract drawings.

3.2 TELECOMMUNICATIONS ROOM EQUIPMENT INSTALLATION

A. The primary function of a telecommunications room is the termination of horizontal, backbone and service entrance cabling to compatible connecting hardware.

B. A telecommunications room also provides a controlled environment to house telecommunications equipment, connecting hardware, and splice enclosures serving a portion of the building.

C. Provide a minimum of one fire retardant plywood backboard 4' w x 8' h x ¾" thick installed vertically at 6" AFF painted with white paint as shown on drawings. See Section 2.1A for additional information. Backboards shall be mounted with fire seal visible and located at the lower left hand or right hand corner. Backboard shall be painted to leave fire seal exposed. The A-side of the plywood backboard shall be facing into the room or space. See contract drawings for location of backboards in the telecommunications rooms and spaces.

D. Provide telecommunications equipment including the following, but not limited to the following, and shall be installed according to the contract drawings:
   1. Equipment racks and enclosures with cable management systems
   2. Equipment rack seismic bracing kits
   3. Cross-connect patch panels and termination blocks, whether they are populated or not
   4. Telecommunications workstation devices
   5. Ladder rack

E. Where applicable, each freestanding equipment rack shall be seismically braced from the top to a structural component beam, column, bearing wall, etc. of the building. Each geographical area shall be considered on an individual basis to ascertain whether seismic bracing is required and if structural engineering services are required.

F. All 110 blocks shall be securely fastened to the backboards or equipment racks located in the telecommunications room. Provide all required D-rings or other approved cable guides as required for a neat and orderly cable management system.

3.3 OPEN CABLING SUPPORT INSTALLATION

A. All cabling shall be run exposed as "open cabling" in ceiling spaces and ceiling plenums, unless otherwise noted

B. Provide all hanger supports and cable supports for cabling specified in this section. All support structures shall adhere to the requirements in the National Electrical Code.

C. Cabling supports shall be spaced 36” apart maximum.

D. Cabling bundles shall not sag a maximum of two inches from the bottom of the cable support.

E. All cabling shall be bundled using plenum rated tie-wraps at mid-span.

F. Provide all additional cable management products as required to protect exposed cabling and complete the installation of cabling in a neat professional manner.

G. All floor penetrations shall be at columns, exterior walls unless otherwise specified.

H. Cabling supports shall be installed on their own support system. The use of ceiling grid supports shall be prohibited.

I. Do not support cables from ductwork, sprinkler piping, water piping, waste piping, conduit or other system supports. Cabling shall never come in physical contact with these mechanical, fire protection and electrical systems and raceways.

J. Cabling bundles and supports changing pathway direction shall maintain proper bend radius as to not impact the physical jacket construction of the cabling. Cabling that becomes damaged during this transition shall be replaced in its entirety.

K. Follow manufacturer’s recommendations for quantity of cables supported in J-hooks and adjustable cable supports.

L. Installers shall observe the applicable requirements and recommended good practices contained within ANSI/TIA-568.1-E & ANSI/TIA-568.2-D standard for cabling installation requirements.

3.4 CABLING INSTALLATION

A. Each telecommunications device shall be connected to the horizontal cross-connect in a telecommunications room with horizontal cabling installed in star topology.

B. Horizontal cabling shall be installed in continuous runs from the telecommunications rooms to telecommunications device locations. Splices are not permitted.

C. Maximum length of horizontal cables shall be 295 feet (90 m) including all service loops.

D. All cabling shall be installed in accordance with manufacturer’s recommendations, including but not limited to maximum tensile loading and maximum bend radius.

E. Cabling shall be organized and identified so as to facilitate locating and handling individual sheaths for maintenance functions.

F. Each bundle shall be neatly bundled without cinching or stressing the cabling, using Velcro straps throughout the building and in all Telecommunications Rooms. Tie wraps are allowed during pulling and trim out only. Tie wraps shall be loose enough so that the tie wrap can be easily rotated around the cabling bundle and does not impact the physical construction of the cabling. Tie wraps shall be replaced with Velcro for final installation.

G. Bundles shall be clearly marked identifying the frame and terminal block to which routed, the station numbers served by the bundle, and any other information that may assist in administration.

H. Provide machine typed wrap around labels on both ends of the horizontal cabling jacket no more than 4-inches from each termination point.

I. Great care shall be taken to protect all cabling from physical damage beneath floors, above ceilings or elsewhere. Cabling shall not be exposed to any forces or handling factors that will degrade performance, such as crushing, pull stressing, twisting, or damaging sheathing materials. When left unattended, all cabling shall be secured and protected to avoid damage. Cabling shall not be left on the floor unattended while pulling to avoid damage from other trades walking on the cabling. Cabling shall be stored off the floor and suspended with approved supports during installation.

J. A spare pull string shall be installed at every outlet installed.

K. Horizontal and backbone cabling shall be bundled and routed separately in dedicated cabling supports in a neat and organized fashion for routing from the telecommunications rooms utilizing open cabling pathways to the telecommunications devices.

L. Route cabling runs from workstations parallel to building grid lines and directly to open cabling pathways.

M. Provide 12 inches of slack in neatly suspended loops above each workstation and 10 feet of slack neatly coiled. Service loops in the telecommunications room shall not be located above the equipment racks and server enclosures.

N. Cables shall contact only dedicated and properly protected cable accesses and support mechanisms.

O. Telecommunications unshielded twisted pair cabling supported utilizing open cabling methods shall maintain a minimum separation of six inches from fire alarm and three inches from intercom/clock, paging, security and CATV broadband cabling. Cabling supports shall maintain increased separation requirements when attaching to the same hanger rod to ensure cabling sag maintains the minimum separation.

P. Maintain the following distances between cabling and other building systems:
   1. One foot from fluorescent lights.
   2. Six feet from motors and transformers.
   3. Three feet from water piping or other mechanical equipment.
   4. One foot from electrical conduits or other electrical equipment.

3.5 CONNECTIVITY AND CABLING INSTALLATION

A. All cabling shall be dressed and terminated in accordance with the cabling installation requirements identified in ANSI/TIA-568.1-E & ANSI/TIA-568.2-D, BICSI Telecommunication Cabling Installation Manual, and the manufacturer's documentation.

B. Cabling entering the telecommunications room and routing shall be separated into cabling bundles specific to the patch panel in which it will be terminated to. Cabling bundles shall be in increments of either 24 cables or 48 cables for Category 6.

C. Cabling shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the equipment rack, enclosure or backboard.

D. Cabling shall terminate from one side of each patch panel only. The cabling shall terminate from the alternate side for the next patch panel position below the previous patch panel termination and shall continue in this orientation for the entire duration of the number rack units per equipment rack.

E. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support straps. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

F. The installation of RJ45 modules into faceplates and attaching of the faceplates to the wall shall ensure that the faceplate and modules are flush. The faceplate shall be secured to the wall but shall not be secured to the wall with such force as to bow the faceplate.

3.6 WORK AREA

A. 4-pair UTP horizontal cabling shall be terminated on a 8-conductor 8-position modular jacks located at each telecommunications device shown on the applicable contract drawings.

B. Each telecommunications device shall be provided with 1, 2, 3 or 4, 8-Position 8-Conductor RJ45 modules as shown on the applicable contract drawings.

C. RJ45 modules shall be mounted in faceplates attached to single gang or dual gang mud rings or other mounting bracket.

3.7 CABLING TERMINATIONS

A. Provide all necessary installation materials, tools and equipment to perform insulation displacement type terminations at all the telecommunications outlets, patch panels and 110 cross-connect blocks.

B. All pairs in each cable shall be terminated on a 110 block, modular patch panel or telecommunications modules in accordance with this specification.

C. All cabling shall be terminated in accordance with the T568B pin configuration standard.

D. Remove only as much of the cable sheath as is necessary to terminate the cabling on the connecting hardware.

E. A maximum of 0.25” of cable pair twists shall be removed from a Category 6 cable. Cabling and terminations exceed these dimensions shall be re-terminated.

F. At the horizontal station patch panel, the cabling shall terminate from the center of the 110 IDC termination.

G. Terminate cabling in accordance with connecting hardware manufacturer’s recommendations. All cabling shall terminate in numerical sequence.

3.8 COPPER BACKBONE INSTALLATION:

A. Rack mounted Category 6, 48-port RJ45 cross-connect panels shall provide a modular interface to facilitate installation and administration of data connectivity from the telecommunications device in the IDF to the MDF via the copper backbone. A port in a telecommunications device can be activated by connecting one end of a modular patch cord to the corresponding port in the

workstation panel and the other end of the patch cord into a port on the cross-connect patch panel.

B. Unless noted otherwise on plans provide (6) 4-pair Category 6 UTP cables from each IDF copper backbone patch panel to the MDF copper backbone patch panel and terminate each 4-pair cable on one 110 block of the patch panel.

C. Where shown on drawings, horizontal or backbone cabling to be terminated on 110-blocks. Cross-connects shall be terminated for all 4-pair of the UTP cabling on C4 clips with a C5 clip at the last spot on the row. Terminations shall be T568B.

3.9 ABANDONED CABLING

A. Contractor shall be responsible for the demolition, removal and disposal of all existing abandoned telecommunications cabling and infrastructure in its entirety per NEC 2020 Article 800 and as identified on the contract drawings. Abandoned cabling shall be defined as any telecommunications cabling that is not terminated at both ends at a module or other equipment and is not identified for future use with a tag.

B. Telecommunications cabling and infrastructure shall include but not limited to, faceplates, surface mount boxes, RJ45 modules, horizontal UTP cabling, copper and optical fiber backbone infrastructure, innerduct, cabling support systems, equipment racks, horizontal and vertical cable management, equipment shelving, ladder tray, dedicated telecommunications surface raceway, 110 and 66 blocks, rack mount and surface mount fiber cabinets and other related passive infrastructure.

C. Contractor shall salvage all telecommunications equipment racks, patch panels, horizontal and vertical cable management and optical fiber connectivity being demolished. These items shall be returned to the Owner unless directed by the Owner to be disposed of by the contractor. All other telecommunications passive infrastructure shall be disposed of by the contractor.

D. Provide blank cover plates for demolished flush mount outlets, surface mount boxes, modular furniture feed locations, and junction boxes.

E. Provide blank cover plate for demolished modular furniture telecommunications devices. Field verify and match modular furniture manufacturer system, make and base channel color.

F. Provide new cover plates for surface mount raceway systems after demolition of existing devices. Cover plate sections shall be seamless between new devices. Cover plates shall match existing base color.

G. Provide fire stopping of existing horizontal and vertical conduit sleeve, after existing horizontal and backbone cabling has been demolished. Provide fire stopping of existing wall penetrations. Seal all penetrations with approved fire stopping materials.

H. Provide (2) pull strings in each vertical conduit riser sleeves at the completion of demolition of existing cabling.

3.10 FIRESTOPPING

A. All cabling running through rated floors and walls shall be firestopped in accordance with the requirements within this Section.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure).

C. Any penetrations created by or for the contractor and left unused shall also be sealed as part of the contractor's scope of work.

D. Firestop putty or pillows shall be used inside conduits to provide a re-enterable system allowing telecommunications cables to be easily removed or added in the future.

E. Firestop systems shall be UL Classified to ASTM E814 (UL 1479).

F. All firestop systems shall be installed in accordance with the NEC and the manufacturer's recommendations and shall be accomplished in a manner acceptable to the local fire and building authorities having jurisdiction over this work.

G. All firestopping sleeved devices shall be installed according to the manufacturer's recommendations including, but not limited to;
   1. Wiring devices shall be installed in locations where indicated on the contract drawings, arranged in a single or multiple sleeve formation at the height specified. Sleeves shall be installed a minimum of 24 inches above the accessible ceiling grid.
   2. Install the devices in strict accordance with the approved shop drawings and the manufacturer's recommendations.
   3. Apply the factory supplied gasketing material prior to the installation of the wall plates.
   4. Secure wall plates to devices per the equipment manufacturer's recommendations.

3.11 TELECOMMUNICATIONS GROUNDING AND BONDING

A. Grounding and bonding connections to the building's structural steel, electrical service main building ground and telecommunications bonding backbone shall be terminated on the left side of the busbar to facilitate access for other grounding sources within the space to be terminated within the center and right side of the busbar.

B. The bonding backbone shall route along the shortest and straightest pathway as possible with minimal bends. Any bend shall be sweeping. The conductors shall be continuous and shall not contain splices.

C. A telecommunications bonding backbone shall connect the main telecommunications grounding busbar to each other telecommunications grounding busbar within the facility.

D. Grounding and bonding conductor distances shall meet the distance requirements described within ANSI/TIA-J-STD-607-A.

E. Grounding and bonding connections shall be a stranded, insulated copper conductor with a minimum size of #6 AWG.

F. Grounding and bonding connectors shall be 2-hole and made with a crimp or other non-reversible termination method.

G. Provide a coupled bonding conductor for outside plant copper shielded cabling routing between buildings and ground to the busbar.

H. Provide grounding and bonding of each building entrance protection block.

I. Each equipment rack shall have a dedicated grounding connection.

J. Provide grounding and bonding of all telecommunications pathways including conduit raceway systems.

K. Coordinate with the flooring contractor to ensure that the grounding strip located below the anti-static dissipative vinyl composition tile flooring is located and terminated directly below the busbar to minimize the distance of the required grounding conductor.

L. Ensure that all grounding and bonding connections break through the paint to the bare metallic surface of all painted metallic hardware.

3.12 INSTALLATION OF OPTICAL FIBER CABLING SYSTEM

A. Installation for Optical Fiber Cabling
   1. Follow cable manufacturer’s specifications regarding handling methods, bend radius and maximum pulling tension limitations.
   2. Typical MDF to IDF room optical fiber backbones shall consist of 12-strand cables.

B. Securing Fiber Cabling
   1. Immediately after cabling installation, a permanent identification tag as indicated shall be attached to visible cabling sections. Cabling shall be checked to ensure that the markings are intact.
   2. Cabling and equipment shall be supported and secured as indicated. Where the specific method of support is not shown, supports and fasteners shall be used to secure cabling and equipment in position. Metallic supports and fasteners shall have a corrosion resistant finish. All cabling shall be routed along the interior sides of manholes.
   3. Corrosion resistant clamps and straps shall be used as necessary to properly secure the cabling.
   4. All optical fiber cabling shall be secured to the optical fiber cabinet using the aramid strength yarn of the cabling to provide strain relief.

C. Optical Fiber Cabling Bending
   1. Caution shall be used when bending cabling to avoid kinks or other damage to the sheath. Bend radius shall be as large as possible with a minimum of 20 times the cabling diameter. Minimum radius shall be increased when necessary to meet cable manufacturer's recommendation. Cabling shall not rest against any sharp edges.

D. Optical Fiber Cabling Pulling
   1. Pulling tension shall not exceed 500 lbs or cable manufacturer's recommendation, whichever is less.
   2. Provide a 20’ foot service loop for all optical fiber cabling located at both ends of the cabling run in all telecommunications rooms. Service loop shall be attached to the fire retardant plywood backboard.
   3. Do not pull optical fiber cables with copper cables.
   4. Do not pull optical fiber cables over existing cables.
   5. When pulling optical fiber cabling in an innerduct or conduit, do not exceed the 40% fill ratio.

E. Optical Fiber Cabling Terminations

1. All cabling terminations shall be made in optical fiber distribution units. All installed optical fiber strands shall be terminated.
2. Optical fiber cabling terminations shall utilize enclosures and components in quantities consistent with the required fiber counts at each end of each segment. During optical fiber connector termination, visually inspect all terminations with a 400-power microscope. Follow all of the connector manufacturer's recommendations. Unacceptable flaws in the terminations will include, but not limited to, scratches, full or partial cracks, bubbles, pits, epoxy residual, dirt, dust, oil, moisture, grinding and sanding debris. The acceptable final termination will show a connector tip that is free of all imperfections in 100% of the core and 80% of the cladding. All unacceptable connectors shall be inspected after rework.
3. Optical fiber cabling slack shall be neatly coiled within the optical fiber cabinet. No slack loops shall be allowed external to the optical fiber cabinet.
4. Each cable shall be clearly labeled at the entrance to the fiber adapter panel.
5. To maintain the correct polarity throughout the optical fiber cabling system, each cabling segment shall be installed in a pair-wise crossover orientation as defined in ANSI/TIA 568.3-D.
6. Dust caps shall be installed on the connectors and couplings.

3.13 LABELING

A. General
1. Labeling shall be in accordance with ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure.
2. All labels shall be permanent typewritten labels produced by a labeling machine.
3. Labels shall be installed on all cabling at each end. Ensure labels are securely fastened.
4. All labels shall be located within 6 inches of cable termination and placed so they can be easily read.
5. The font type for each type of label shall be Arial.
6. Labeling information will be reviewed at the Pre-Construction Meeting.
7. All labeling shall be completed prior to the substantial completion date of the project.

B. Telecommunications Device Labeling
1. Each telecommunications outlet shall be labeled in accordance with ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure and the Owner's standards.
2. The label shall be produced to fit into the recess provided and covered with a clear plastic cover.
3. The labeling shall be a follows for a building with multiple telecommunications rooms:
   a. 1B-11-01-01 where:
      1) 1B = Telecommunications Room (MDF or IDF) (1=Floor number)
      2) 1B = the B is utilized as an alphanumeric identifier when multiple TRs exist on a floor. Letter designation shall occur from West to East for the locations of the TR.

3) –11 = Rack Number (12, 13 and so on for additional racks)
4) –01 = Patch Panel Number (02, 03 and so on for added panels)
5) –01 = Port Number

C. Equipment Rack Labeling
1. Provide plastic lamacoid nameplate for each equipment rack or wall mount enclosure in the telecommunications room or space
2. Plastic lamacoid nameplate shall be black with white letters. The nameplate shall be machine engraved with a size 36 font.
3. Mount the name plate at the top of each equipment rack or wall mount enclosure.
4. Labeling scheme is provided on the contract drawings.

D. Patch Panel Labeling
1. Station Patch Panel
a. 48-port modular patch panels shall be labeled with sequential numbering starting with “01” for the topmost patch panel and moving downward to the bottom of the rack. Patch panel labels shall be affixed to the left hand side of the patch panel.
b. Horizontal cabling distributed from station patch panels to wireless access points and security devices shall have a label in the designation strip space directly below the RJ-45 module identifying the device interconnect point. The designation label shall be “WAP - #”, where the “#” represents the Owner’s wireless access point identification number. The designation label shall be “CCTV - #”, where the “#” represents the Owner’s CCTV security camera identification number.
2. Copper Backbone Cross-Connect Patch Panel
a. Copper backbone cross-connect patch panels shall indicate the port number of the MDF in which each IDF port terminates at the MDF copper backbone patch panel. The MDF copper backbone cross-connect patch panel ports shall indicated each IDF by name and patch panel port number.

E. 110 Wiring Block Labeling
1. 110 designation strips shall be clearly labeled to identify the cabling terminated on each wiring block.

F. Rack Mount Fiber Cabinet Labeling
1. Labeling shall be placed within the designation strip holder of the fiber adapter panel when 3-duplex style fiber connectors are utilized.
2. Labeling shall be placed on the inside of the front door for surface mount fiber cabinets and rack mount fiber cabinets when 6-duplex style fiber connectors are utilized.
3. Labeling shall contain the originating telecommunications room designation, rack row if applicable, equipment rack number designation, rack mount fiber cabinet number, fiber adapter panel position(s) and the associated fiber strand numbers by individual strands and/or optical fiber subunit classification.
4. The Main Distribution Frame (MDF) will have labeling associated for the distribution of optical fiber cabling to each telecommunications room and

the telecommunications room (IDF) will have labeling associated from the MDF.

G. Optical Fiber Labeling
1. Interbuilding and intrabuilding optical fiber cabling shall be clearly and visibly identified by the contractor in all manholes, pull boxes, riser room pull points, entrance points, service entrance and 3' before entering a free standing rack, wall mounted enclosure or surface mount fiber cabinet utilizing an optical fiber cable identification tag.
2. Optical fiber cable identification tags shall contain the following information at a minimum.
   a. Cable part number
   b. Extent of cable run (e.g. From: MDF – To: IDF-B)
   c. Cable type and description

3.14 TESTING

A. Test procedures shall be as prescribed by the ANSI/TIA, Insulated Cable Engineers Association and the National Electrical Testing Association.

B. Test Equipment
1. The network testing equipment shall be a Fluke Networks DTX-1800 Cable Analyzer and shall have a certified calibration from the manufacturer within the past six months. Proof of calibration shall be provided with the product submittal. Test equipment shall be utilized to test horizontal and backbone cabling.
2. New permanent link adapters shall be provided for the main test end and smart remote test end prior to the start of testing. New permanent link adapters shall be provided for every 1,000 tests. Proof of permanent link adapters shall be provided prior to the start of testing. Test adapter cords shall be coiled and stored as to prevent any twisting or kinking that will distort the accuracy recordings of the tests.
3. The field tester and adapters shall be certified by an independent laboratory as meeting or exceeding Level IIIe as defined in ANSI/TIA-1152.
4. The RJ45 test plug for the network testing equipment adapters shall be in range of values defined in Annex C with ANSI/TIA-568.2-D for Near-end Crosstalk, Far-end Crosstalk and Return Loss.
5. The test equipment shall be able to test up to a 900 MHz frequency range.
6. The test equipment shall be ISO 9001 certified.
7. The telecommunications contractor shall maintain an electronic copy of the manufacturer’s testing procedures in the job site office.
8. The test equipment batteries shall be charged daily and a level of greater than twenty-five percent of capacity shall be maintained during the testing.
9. The test equipment shall be calibrated daily before the start of testing.

C. Horizontal Cabling
1. All horizontal cabling shall be certified to meet or exceed the permanent link performance specifications for Category 6 horizontal cabling as defined in ANSI/TIA-568.2-D.

2. Certifications shall include the following parameters for each pair of each cable installed:
   a. Building Identification
   b. Cable Identification.
   c. Date of test
   d. Test equipment manufacturer and model number
   e. Wire map
      1) Continuity to the remote end.
      2) Shorts between any two or more conductors
      3) Reversed pairs
      4) Split pairs
      5) Transposed pairs
      6) Any other miswiring
   f. Length
   g. Insertion Loss (Attenuation)
   h. Near-end Crosstalk (NEXT)
   i. Power Sum Near-end Crosstalk (PSNEXT)
   j. Attenuation to Crosstalk Ratio (ACR)
   k. Power Sum Attenuation to Crosstalk Ratio (PSACR)
   l. Equal-level Far-end Crosstalk (ELFEXT)
   m. Power Sum Equal-level Far-end Crosstalk (PSELFEXT)
   n. Return Loss
   o. Propagation Delay
   p. Delay Skew
3. All horizontal cabling shall be tested using a Permanent Link configuration as defined in ANSI/TIA-568.2-D.
4. Testing shall be conducted with frequency range from 1MHz to 250MHZ.
5. Permanent link testing headroom and Near-End Crosstalk (NEXT) shall have a minimum performance value of 5.0 dB or greater for Category 6 tests. Test reports with a result less than 5.0 dB, is marked with an asterisk (*) or fails, shall be documented identifying the reason for the test failure and a corrective action plan developed.
6. After corrective action has been completed, the permanent link shall be retested.
7. It is the Telecommunications Contractor’s responsibility to ensure 100 percent of the network horizontal cabling system links pass all tests with the minimum acceptable headroom performance level of 3.0 dB or greater.
8. The test results shall be organized by building identification and cable identification number. The test results shall contain the date and time of when each test was saved in the memory of the tester. The test results shall be recorded on a stick drive in PDF format.

D. Backbone Cabling – 100 ohm UTP
1. Continuity tests shall be performed on all backbone cabling pairs and/or conductors.
2. Testing procedures shall include the following parameters for each pair of each cable installed:
   a. Wire map
      1) Continuity to the remote end.
      2) Shorts between any two or more conductors

3) Reversed pairs
4) Split pairs
5) Transposed pairs
6) Any other miswiring

b. Length

3. The test shall be recorded as pass/fail as indicated by the test set in accordance with the manufacturers recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number.
4. Any cabling link that fails the testing will be documented, identifying the reason for test failure and a corrective action plan.
5. After corrective action has been completed, the link shall be retested.

E. Optical Fiber

1. Fiber Optic Cable Testing
   a. Test all cable and connections for continuity and repair all defects. Testing must be completed with an Optical Loss Test Set capable of testing OM3 fiber to the application required. Total loss budget for any fiber channel shall not exceed 2.6dB. Testing requirements must meet ANSI/TIA-526-14-C.
   b. O.T.D.R. tests after the connectors are installed will be included for all strands and fiber optic power metering testing is required while on reel. Submit all test results to Architect and Engineer.
   c. Test per Ortronics and ANSI/TIA-568.D-3 testing requirements. The nCompass warranty requires bi-directional testing using both wavelengths. All testers must show a calibration within the 12 months prior to ensure accuracy. No Fail test results are allowed. The contractor must request a warranty from Ortonics shall be within 30 days of the project completion. Ortronics will issue a Limited Lifetime Static, Dynamic and Application Assurance channel warranty to the end user thru the contractor.

END OF SECTION

SECTION 27 53 19

DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.1 GENERAL

A. Conform to General Conditions, Supplementary Conditions, and Division 1.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

C. All products submitted shall meet the Buy America Act.

1.2 SUMMARY

A. This specification serves as bidder design technical and performance criteria to provide a complete and full operational Distributed Antenna System (DAS) to support public safety radio coverage within 1116 Fruitvale Blvd Yakima, WA to meet the coverage requirements of the International Fire Code Section 510, as amended by the Washington State Fire Code per the City of Yakima Municipal Code.

B. Equipment specific to the DAS shall be designed, specified, furnished, installed, tested and placed in service by a Contractor experienced in this type of work.

C. The installation shall result in a system that is capable of expansion to fully support in-building coverage for 800MHz EPSCA Public Safety as well as future migration to 700MHz Public Safety radio. DAS Equipment installed and antennas shall be minimally capable of supporting both 700MHZ and 800MHz frequencies.

D. The DAS components specified in this document include:
   1. Bi-Directional Amplifiers (BDA),
   2. Pre-manufactured cable/remote units
   3. Donor Antennas,
   4. Coverage Antennas,
   5. Coaxial Cable and Coax Connectors
   6. Splitters, Combiners, and Couplers
   7. Uninterruptable power supplies (UPS) to meet the requirements of the IFC 2015.
   8. Wall mount Nema 4 enclosures for all remote fiber units and their respective UPS.
   9. Single Mode Fiber Optic cabling

1.3 RELATED SECTIONS

A. 27 05 26 Grounding and Bonding for Communications Systems

B. 26 05 28 Hangers and Supports for Electrical Systems

C. 27 10 00 Telecommunications System

1.4 SYSTEM DESCRIPTION

A. Services: Upon Acceptance Testing, the DAS shall provide coverage for the PSNs listed below on all frequencies currently being used by the designated PSNs in the given market.

Service	Uplink, MHz	Downlink, MHz
700 Band	788-805	758-775
800 Band	806 - 816	851 - 861

B. PSN Coordination/Approval:
   1. The Contractor shall propose and deploy a DAS system capable of receiving approval of the PSN Authority Having Jurisdiction (AHJ).
   2. The Contactor shall coordinate and submit all documentation required for AHJ approval.

C. Broadband Active Distribution: Single-mode fiber-optic cable will be used for active distribution. In-line amplifiers are not allowed.

D. Network Management/ Alarming:
   1. NMS: The DAS shall have a Network Management System (NMS) capable of alarm, monitor, configuration and control of all Active Components.
   2. The DAS shall provide output connections to the Fire Alarm system to support supervisory and trouble alarms per the IFC 2015.
   3. NFPA 1221-2019 Section 1.07 and 9.6
   4.

1.5 PERFORMANCE REQUIREMENTS

A. PUBLIC SAFETY NETWORK (PSN) DAS:
   1. The PSN DAS shall comply with 2018 IFC 510 as amended by Washington State Fire Code.
   2. The DAS shall deliver coverage per the criteria in Table 1 throughout 95% of all occupied building spaces.

TABLE 1 SYSTEM PARAMETERS PSN

Parameters	Units	Public Safety 380-512, 700, 800 MHz
Minimum Downlink RSL	dBm	-95

1.6 SUBMITTALS

A. Submittal Requirements with the Bid:
   1. Certificates
      a. An FCC-issued general radio operator license (GROL) for the installation personnel.
      b. A certificate from the manufacturer of the equipment to be installed stating that the DAS installer is trained/ qualified on the equipment.
      c. iBWAVE Software Certifications
   2. Test Equipment

a. Submit certificates indicating that staff is certified on required test equipment including by not necessarily limited to:
b. Signal Generators
c. Spectrum Analyzers
d. Submit current calibration data for test equipment to be used.

3. Equipment cutsheets on any equipment proposed for substitution in compliance with Section 1.07 of the specifications.

B. Submittal Requirements Prior to Start of Construction
1. Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.
2. To scale floor plans showing the location of system Components.
3. Final RF link budget
4. Detail Drawings for Donor Antenna and grounding
5. RF propagation modeling (Heat maps)
6. Product Data Sheets for each type of equipment to be installed.
7. Maintenance Service Contract
8. Permit drawings as required by the AHJ.

C. Test Equipment
1. Submit certificates indicating that staff is certified on required test equipment.
2. Submit current calibration data for test equipment to be used.

D. Submittal Requirements at Close Out
1. Drawings: Submit as-built drawings indicating:
a. Donor antenna, grounding and lighting protection details
b. Cable routing, splitters, couplers and coverage antenna locations
c. Active component locations, layout and configuration
2. Test Reports
a. PSN: Submit Accepted ATP reports confirming the requirements of Section 1.04 have been met.
b. WSP DAS: Submit accepted ATP reports confirming the requirements of Section 1.04 have been met.
3. Cable Test Reports: Submit cable test results for all cable segments. Testing shall include Return Loss (RL), Distance to Fault (DTF) and Passive Intermodulation (PIM).
4. Operation and Maintenance Data: Submit hardware and software manuals for all Active Components.
5. Acceptance Certificate or Document from the AHJ
6. Warranty Documents:
a. Submit for all manufactured components specified in this Section.
b. Submit Contractor's System Warranty.
c. Submit Manufacturer's Extended Warranty

1.7 CODES AND STANDARDS

A. All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation, workmanship, maintenance and testing shall comply with the latest editions of the National Electrical Code, National Electrical Safety Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractors Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents

noted above, the contractor shall satisfy the most stringent requirements. Equipment and cabling installation shall comply with the following standards. All publications must be of the latest issue and addenda:

1. NFPA 70, National Electrical Code (NEC®)
2. International Fire Code as amended by Washington State Fire
3. Yakima Municipal Code
4. NFPA 1221
5. Federal Communications Commission (FCC) - Title 47 of the Code of Federal Regulations, Part 90.
6. Federal Communications Commission (FCC) Rules, Parts 15 and 22
7. ANSI/TIA-568-C.O: Generic Telecommunications Cabling for Customer Premises
8. ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
9. ANSI/TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards
10. ANSI/ TIA-568-C. 3: Optical Fiber Cabling Components Standards
11. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
12. ANSI/TIA-606-A: The Administration Standard for the Telecommunications Infrastructure of Commercial Building
13. ANSI/ TIA-J-STD-607 -A: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
14. BICSI Information Transport Systems Installation Methods Manual
15. BICSI Telecommunications Distribution Methods Manual

B. ABBREVIATIONS

1. ACG: Automatic Gain Control
2. AHJ: Authority Having Jurisdiction
3. ATP: Acceptance Test Plan
4. AWS: Advanced Wireless Service
5. BDA: Bi-Direction Amplifier
6. BOM: Bill-of-Material
7. BRS: Broadband Radio Service
8. BTS: Base Transceiver Station
9. CDMA: Code Division Multiple Access
10. C/N: Carrier-to-Noise Ratio
11. CW: Continuous Wave
12. CWDM: Coarse Wave Division Multiplexing
13. DAS: Distributed Antenna System
14. DWDM: Dense Wave Division Multiplexing
15. EBS: Educational Broadband Service
16. ESMR: Enhanced Specialized Mobile Radio
17. FCC: Federal Communications Commission
18. GROL: General Radio Operators License
19. GUI: Graphical User Interface
20. iDEN: Integrated Enhanced Digital Network
21. LMR: Land Mobile Radio
22. LTE: Long Term Evolution
23. MIMO: Multiple Input, Multiple Output
24. MTBF: Mean Time Between Failure

25. NFPA: National Fire Protection Association
26. NMS: Network Management System
27. PCS: Personal Communications System
28. PSN: Public Safety Network
29. RoF: Radio-over-Fiber
30. RoHS: Restriction of Hazardous Substances
31. RSL: Received Signal Level
32. SISO: Single-Input, Single-Output
33. SMR: Specialized Mobile Radio
34. SMS: Short Message Service
35. SNIR: Signal-to-Noise Interference Ratio
36. SNMP: Simple Network Management Protocol
37. SOW: Statement of Work
38. VSWR: Voltage Standing Wave Ratio
39. WSP: Wireless Service Provider

1.8 DEFINITIONS

A. Acceptance: Expressed approval by the customer

B. Active: DAS components that require AC/DC power for operation

C. Channel: A path for an RF transmission between two points

D. Component: A main system element of the DAS

E. Contractor: The owner's provider/installer unless noted otherwise.

F. Passive: DAS components that do not require AC/DC power for operation

1.9 QUALITY ASSURANCE

A. Source Limitations:
1. Obtain equipment from a single manufacturer.
2. Contractor must have an office within 100miles of the project site.
3. Contractor or systems integration partner shall have all major components in stock.

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. The work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for work described in this Section shall be or will subcontract with established DAS/RF communications contractors. The contractor shall have direct access to all tools and test equipment required to complete the work prior to submitting a bid.

D. Requirements set forth by first-responder code, ordinance, or the PSN AHJ shall supersede the requirements described herein and shall be met in their entirety. It is the Contractor's responsibility to ensure that the DAS complies with local code, ordinances or requirements established by the PSN AHJ.

E. PSN Approval
1. When approval of the DAS deployment is required by code or ordinance, the Contractor shall be responsible for facilitating the AHJ approval(s) per the requirements of the code or ordinance.

F. WSP Approval

1. The Contractor shall be responsible for providing the WSP with information each WSP requires to approve interconnection of the DAS to the WSP's macro network.

1.10 WARRANTY

A. Manufacturer Warranty:
   1. Splitters, Couplers and Coverage Antennas: 5-year limited warranty from date of system acceptance.
   2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
   3. Active Components: The earliest of 1-year limited warranty from date of system installation or 15 months from date of shipment.

1.11 MAINTENANCE

A. The Contractor shall provide a maintenance service contract, covering the system for a period of one-year with options up to five years: preventative maintenance, system monitoring, spares, fault mitigation, equipment repair, and response time.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturer shall be:
   1. COMBA
   2. Or approved equal.

2.2 ENTERPRISE HEAD END

A. Bidirectional Amplifier
   1. BDA: The BDA shall be of modular design and use digital filtering to mitigate interference and accommodate multiple services for PSNs.
   2. Characteristics:
      a. Operating Temperature Range: -40 °C to +55 °C
      b. Chassis: Shall be of modular design with ≥ 4 frequency bands per 19" chassis. Chassis shall not exceed four Rack Units (RUs) in height.
      c. Filtering: Digital
      d. FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ ESMR frequency bands
      e. Alarming: Shall support SNMP using wireless modem
      f. Mounting Options: Shall support rack, wall and pole mounting
      g. Base Scope
         1) PSN - Frequency Bands Supported: 758 - 775 MHz LMR, 788 - 805 MHz LMR/SMR/ESMR
         2)
   3. Compliance:
      a. IFC: The BDA shall comply with 2015 IFC requirements for supervision and monitoring.
      b. FCC: Shall be FCC type certified.

B. DONOR ANTENNA
1. Donor Antenna:
a. Public Safety
1) 698-940 MHz
2) Electrical Specifications

Gain	15 dB
VSWR	1.5 : 1
Horizontal Beamwidth	26 ± 3 °
Vertical Beamwidth	26 ± 3 °
Polarization	Vertical
Maximum Input Power	100 Watts
Electrical Downtilt	0 °
Front-back Ratio	>16 dB
Connectors	N-Female
Lightning Protection Direct	Ground
Rated Wind Speed	134 mph / (216 Kph)
Max. Dimensions of Antenna	27.6 x 27.6x 5.31 in
Weight of Antenna	18.6 lbs.

2.3 COVERAGE ANTENNAS

A. Omni-Directional Coverage - Omni-Directional Coverage antennas shall feature a multi band design, accommodating multiple frequency bands in a single small antenna.

Pattern Type:	omnidirectional
Frequency Range:	698-960 MHz 1695-2700 MHz
Gain:	3.2 dBi
VSWR:	<1.7:1 / 11.8dB
Polarization:	Vertical
Impedance:	50 ohms nominal
Diameter:	12 in
Height:	1.2 in
Weight:	.86 lb

Connector:	4.3-10 DIN
Warranty:	1 Year Limited
Construction:	UV Stabilized ABS
Ground Plane:	Built In
Overall Dimensions	
Color	Black or White
Pigtail Included	Yes
Pigtail Length	18 in
Application	In Building
Mounting Style	3/4 in stud Mount
Mounting Hardware	Optional L-Bracket Available (PN/ 10227)
H. Beamwidth (deg.)	360

1. Each antenna assembly will be provided with 60' of pre-terminated Plenum Rated, Low PIM, Braided Coaxial cable.
2. Provided with one 3-way splitter per 3 antennas.

2.4 COAXIAL CABLING

A. Manufacturer: Commscope or approved equal
   1. Construction Materials:
      a. Jacket Material: PVC
      b. Outer conductor material: Corrugate copper
      c. Dielectric Material: PE Spline
      d. Flexibility: Standard
      e. Inner Conductor Material: Copper-clad Aluminum wire
      f. Jacket Color: Off-White
   2. Dimensions
      a. Nominal Size: (1/2 inch)
   3. Electrical Characteristics
      a. Cable Impedance: 50 ohm ±1 ohm
      b. Capacitance: 23.0pF/ft
      c. Operating Band: 1 – 6000 MHz
   4. Mechanical Specifications
      a. Fire Retardancy Test Method: NFPA 262/ CATVR/ CMP

2.5 FIBER OPTIC CABLING

A. Description: Singlemode, 6 fibers, single unit riser distribution cable with interlocking aluminum armor.

B. Jacket:
   1. Jacket color: Yellow
   2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 50 inches (1000 mm).

C. Standards:
1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-104-696 for mechanical properties.

2.6 UNINTERRUPTABLE POWER SUPPLIES

A. Provide Uninterruptable power supply for DAS Headend equipment and each remote serving the public safety DAS to supply 24 hours of runtime per IFC. The demand load for the Headend equipment shall be 275 watts and the demand load for each remote repeater unit shall be 110 watts.

B. UPS equipment shall be installed in NEMA 4 enclosures and shall be monitored by the Fire Alarm System per the requirements of IFC.

C. Suggested products:
1. UPS for Headend equipment
2. NEWMAR PE 48V-480W-55AH-UL

2.7 SPLITTERS, COUPLERS AND CONNECTORS

A. 2-way Wideband Power Splitter: Microlab or approved equal.
1. Frequency Range: 70-2700 MHz
2. Impedance: 50-ohm nominal
3. Power Rating: 100 W avg.
4. Connector: 4.3-10

B. In Line Splitter: Microlab or approved equal.
1. Frequency Range: 575-2700 MHz
2. Impedance: 50-ohm nominal
3. Power Rating: 50 W
4. Connector 4.3-10

C. Directional Coupler: Microlab or approved equal.
1. Frequency Range: 698-3600 MHz
2. Impedance: 50-ohm nominal
3. Power Rating: 200W Avg, 1.5kW pk
4. Connector: 4.3-10

D. 4.3-10 Male Connectors: JMA or approved equal.
1. Frequency Range: DC to 6 GHz
2. Impedance: 50-ohm nominal
3. Voltage Withstand: >3.0kV
4. Shielding Effectiveness: <-120dB

E. 4.1-9.5 DIN/M Connectors: JMA or approved equal.
1. Frequency Range: DC to 6 GHz
2. Impedence: 50 ohm nominal
3. Voltage Withstand: >3.0kV
4. Shielding Effectiveness: <-120dB

F. N-Male Straight Compression Connectors: JMA or approved equal.
1. Frequency Range: DC to 6 GHz
2. Impedence: 50 ohm nominal

3. Voltage Withstand: >3.0kV
4. Shielding Effectiveness: <-120dB

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor shall design, install, commission and test the DAS in accordance with the manufacturer's instructions and recommendations.

B. Locate equipment, antennas and splitters at for complete system coverage.

C. Extend cabling from the EOS enclosures to the splitters in a neat and orderly. Support cabling in compliance with NEC chapter 8 requirements and manufacturers recommendations.

D. Maintain a 6" minimum distance from the DAS cabling and other cabling for parallel runs. Do not install coaxial cabling open in any areas were the cabling will subject to physical damage.

E. Install antennas in or above ACT.

3.2 EQUIPMENT MOUNTING

A. Install wall mounted EOS Enclosures in equipment spaces in accordance with manufacturer's instructions and seismic requirements.

B. Install EOS Headend equipment rack in equipment space. Fasten to the floor per manufacturer's instructions and provide seismic bracing if required in compliance with local codes.

C. Install donor antennas as required by manufacturer..

3.3 COORDINATION WITH OTHER TRADES

A. Field coordinate the installation of the EOS headend equipment and remotes to ensure that each location is provided with the following:
   1. Circuiting for UPS equipment.
   2. Grounding per NEC and TIA standards.
   3. Coordinate Alarm and Monitoring points with the Fire Alarm contractor.

3.4 EXAMINATION

A. The contractor must examine areas and conditions under which DAS components are to be installed and notify the owner's representative, in writing of those conditions which are, in the Contractor's opinion, potentially detrimental to proper completion of the work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the owner.

B. Examine pathway elements intended for cable, check raceways, cable trays and other elements for compliance with space allocations, installations tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Specific items of examination shall include, but shall not necessarily be limited to, the following:
      a. Locations for all new DAS antennas, cable and splitter equipment.

b. The Contractor shall examine all rooms designated to house DAS equipment to ensure adequate space, power, and environment conditions to support installation.

3.5 TESTING

A. Acceptance testing will be performed confirming the requirements have been met.

B. All tests shall be conducted, documented and signed by qualified and competent personnel that includes: persons in possession of a current FCC license, or a current technician certification issued by the Associated Public Safety Communications Officials International (APCO) or the Personal Communications Industry Association (PCIA), or a qualified radio engineer licensed as a registered professional engineer by the State of Washington.

C. Testing Procedure (PSN):

1. Test Location
   a. Each floor of the building shall be divided into a grid of 40 approximately equal test areas and must include any/all stairwells and elevators at each level.
   b. Testing shall conform to the requirements and procedures of the latest edition of TIA TSB 88
   c. Downlink received signal level measurements will be recorded in the coverage area using a CW test signal. Measurements will be collected using a spectrum analyzer and a dipole antenna.
   d. A maximum of two (2) non-adjacent areas will be allowed to fail the test per level In the event that three of the test area fail the test, in order to be more statistically accurate, the floor shall be divided into 60 equal test areas.
   e. A test location approximately in the center of each test area shall be selected for the test. Once the location has been selected, the location shall represent the entire test area.
2. Equipment Requirements
   a. Test equipment shall be allowed to stabilize in test environment prior to calibration for a minimum of thirty minutes. Any change in temperature can void the calibration.
   b. Signal generator must be connected to the Head end downlink (TX) interface via tested and approved coaxial cabling and connectors.
   c. Signal generator transmits frequency (MHz) and Power (dBm) must be preapproved by project engineer prior to testing. The control channel from the base station can be used as a signal source as well.
   d. Verify that all remote units for the area under test are ON.
   e. Test frequency and power must be recorded corresponding to the date and time of each site walk measurement.
   f. Spectrum analyzer with unity gain (0dB, frequency specific) dipole receive antenna must be preapproved by the project engineer.
   g. Site walk screen shots shall be saved with frequency span +/- 20 MHz relative to the center/measured frequency.

h. Testing personnel shall have testing equipment that is appropriate for the testing procedure, and that test equipment shall have been calibrated within six months prior to the testing.

3. Documentation
   a. Exact location of measurement must be marked on the grid print.
   b. Screen shots must be taken in all designated grid spaces. If more than one reading is saved per grid zone, saved results shall be distinguished from one another using Grid##"A", Grid## "B" etc.
   c. Results of testing are reported to project engineer for analysis and reporting.

D. Proof of Performance and Testing Methodology:
1. Test requirements specified in this document shall be successfully completed prior to issuance of a Certificate of Occupancy and yearly thereafter. Also testing with a successful result shall occur whenever a design change is made to the system, which changes the technical performance or coverage of the system. All tests shall be coordinated 10 days in advance with the AHJ. Results of the test shall be reported in writing to the AHJ.

E. Technical training
1. The Contractor shall be responsible for organizing a structured demonstration of acceptance tests to ensure organized and efficient testing.
2. The Contractor shall provide written notice to the owner's representative at least thirty (30) calendar days in advance of the initiation of final system acceptance testing. Included in the advance notice shall be three (3) copies of the approved test plans and procedures to ensure acceptance test monitoring personnel are familiar with the tests, procedures and the expected results.
3. It is the responsibility of the Contractor to notify the owner's representative at appropriate times to permit visual inspections of all DAS components. No Installation work shall be covered until a visual inspection has been completed.
4. Provide the owner's representative with the opportunity to witness all testing. On reasonable request and with ten (10) working days' notice, the Contractor shall demonstrate that the test procedure competently identifies the parameter being demonstrated or the fault condition being tested.
5. The Contractor shall provide a Certificate of Compliance signed by a responsible company representative after completion of the site installation. This document shall certify that each element of the installed system and wiring complies with the requirements of the Contract Documents and the certification shall be included with the final acceptance report.
6. The Contractor shall provide training for elements of the DAS. Such training shall include management, operational and maintenance levels and shall be provided to individuals (maximum of 3) to be designated by the owner's representative.
7. Training shall be conducted by qualified personnel fully conversant on the equipment, materials, software, and over all operation of the installed elements. Training shall be based upon as much hands-on training as is possible. The Contractor shall provide all necessary training aids and materials, which shall include written handouts.
8. All training shall be completed prior to Final Acceptance.

3.6 TRAINING

A. Retain the Systems Integrator to instruct the Owner/ Owners Maintenance Personnel on the proper operation of the system including alarms.
   1. Provide time for 1 training session for one hour.

B. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 27 70 21

AREA OF RESCUE COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Intercommunication devices shall be provided at the landing serving each elevator or bank of elevators on each accessible floor that is one or more stories above or below the level of exit discharge.

B. The Area of Refuge Command Center is to be located at a central control point on the first floor or as determined by local Authority having jurisdiction.

C. The Emergency communication hardware shall comply with the Americans with Disabilities Act (ADA). The Command Center Call Box shall have the ability to be programmed with up to 2 emergency phone numbers. Upon activation of the emergency push button, a call will be automatically placed to the Command Center. If no one answers at the Command Center, the Command Center Call Box must dial a secondary location outside the building to activate two way off-site person to person voice communications.

D. Related Sections:
   1. Division 27 Section "Basic Materials & Methods for Communications Systems" for voice and data cabling associated with system panels and devices.

1.3 SUBMITTALS

A. Submit Product data sheets. Include operation manuals.

B. Wiring or Shop Diagrams detailing wiring schematics, cabling.

1.4 WARRANTY

A. The Command Center and Command Center Call Boxes shall be warranted for a period of three years.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. RATH Area of Refuge

B. Or approved equal

2.2 CONSTRUCTION

A. The Area of Refuge Command Center shall have a powder coated steel housing (surface or flush mount), black coil cord emergency Handset and be powered from the Termination Module.

B. Termination Module must be a surface mount enclosure, include connections for 16 up to 112

C. Command Center Call Boxes and power both the Command Center and the Command Center Call Boxes on a two-wire connection. The Termination Module shall be powered from 120vac power with a battery backup that provides power for a minimum of 3 hours.

D. The Area of Refuge Command Center Call Boxes must be in full compliance with Americans with Disabilities ACT (ADA). Command Center Call Boxes require a hands-free speakerphone with an LED to indicate status of call.

E. The Area of Refuge Command Center Call Boxes must allow the programming in of a specific location message of the unit. This allows Rescue personnel to know the location of the activated Command Center Call Box.

F. The Area of Refuge Command Center Call Boxes must have a Braille faceplate located no higher than 48” for front reach and 54” for side reach above ground level to ensure conformance with the ADA requirements.

G. The Area of Refuge Command Center must provide an audible and visual indicator that a Command Center Call Box has been activated.

H. The Area of Refuge 120vac Power Supply must be capable of supplying power to a maximum of Call Boxes, one Command Center and one Termination Module.

2.3 MOUNTING

A. The Area of Refuge Command Center is to be mounted on a flat wall surface.

B. Areas of Refuge Command Center Call Boxes are to be wall surface or flush mounted.

2.4 ELECTRICAL

A. The Refuge Command Center and Command Center Call Boxes are to be powered by the Termination Module.

B. Termination Module shall be powered by the Rath power supply. It shall require 120vac power and provide battery back-up capable of providing a minimum of 3 hours of electrical back-up in case of building power failure.

C. Each Command Center Call Box shall connect to the Termination Module with a single wire pair. Wire pairs shall be shielded if near any power runs, otherwise standard pair is acceptable.

D. System shall be in compliance with all state and local Electrical Codes.

E. All conduit, and/or wiring between remote elevator lobby stations and master shall be 2hr rated.

2.5 COMMUNICATIONS

A. The Command Center Call Boxes shall be an ADA compliant and vandal resistant speakerphone.

B. The Command Center Call Boxes shall be Hands-Free and be a push-button-once to talk system. Once the button has been pushed, the Command Center Call Box will call the Command Center. If no answer at the Command Center, it will automatically call a preprogrammed emergency number. The Command Center Call Box must be capable of being programmed with up to 2 emergency numbers.

C. Command Center Call Box shall have Location Message capability. Command Center Call Box must have a minimum 25 second recordable message capability, programmable to play 1 or 2 times. Command Center Call Box shall notify called party of the location of the call upon being received at the emergency dispatch center.

D. Command Center Call Box shall be capable of allowing the called party to replay the Location Message if necessary, to ensure an understanding of the caller location.

E. If system is not attended to 24 hours a day, the Command Center Call Box must dial a secondary location outside the building to activate two-way off-site person to person voice communications.

F. Once call has been made (button pushed), the call can only be terminated by the called party.

G. Command Center Call Box must have a red LED that will light up upon push of the button. The light shall be a solid color when the Command Center Call Box is activated, and will flash when call has been answered.

H. The Command Center Call Box must be capable of being programmed and reprogrammed on- site.

I. Standard Command Center Call Box features:
   1. Two number programming.
   2. Operating Temperature of between -40"F to +150"F (-40" to + 65' C) 3. On-Site Programmable.
   3. EEPROM memory to protect programming

PART 3 - EXECUTION

3.1 INSTALLATION

A. Connect call box devices to the Termination Module via the special wiring harnesses.

B. Wire the Phones to single pair 22 or 24 gauge cabling.

C. Install the Area of Refuge Command Center Call Boxes no higher than 48” above ground level to ensure conformance with the ADA requirements.
   1. Provide Flush mount Stainless steel Model in the elevator lobbies.
   2. Provide Surface mount stainless Steel Model in the stairwells.

D. Ground and bond intercom equipment and circuits in accordance with Section 27 05 26 “Grounding and Bonding for Communications” and manufacturer’s instructions.
   1. Refer to manufacturer’s installation instructions for details.

3.2 FIELD QUALITY CONTROL

A. Provide new equipment, components, and wiring to eliminate audible noise, clicks, pops, or hum when system is in standby or operation.

B. Include services of technician employed by manufacturer to supervise installation, adjustments, final connections, programming, system testing, and Owner training.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This specifications and fire alarm drawings are basis of design. Provide a complete bidder design addressable fire alarm system complete with a fire alarm control panel, remote annunciator, smoke detectors, heat detectors, manual pull stations, duct detectors, audio/visual notification devices, sprinkler devices, fire/smoke dampers, door closers, door holders, pre-action systems, and all wiring.

B. Submit fire alarm design documents and shop drawings to Authority Having Jurisdiction (AHJ) for plan review. Obtain fire alarm system installation permits.

C. Install, program and test system to the satisfaction of the Owner's Representative and all code enforcement authority.

D. Contractor will provide all fire watch if the fire alarm will be out of service during replacement.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping

B. Section 08 70 00 - Door Hardware

C. Section 26 05 33 - Raceways and Boxes for Electrical Systems

1.3 CODES AND STANDARDS

A. Perform all work in accordance with the requirements of the latest issue of the following codes and standards, unless specifically directed otherwise in this specification in order to allow designs in excess of the code requirement.

1. International Building Code
2. International Mechanical Code
3. International Fire Code
4. NFPA 70 – National Electrical Code
5. NFPA 72 – National Fire Alarm Code
6. NFPA 101 - Life Safety Code
7. NEC - National Electric Code (NFPA 70)
8. NFC - National Fire Code
9. American Disabilities Act
10. Underwriter's Laboratories, Inc. (UL) Standards: 50, 268, 864, 268A, 521, 228
11. 464, 38, 346, 1481, 1076, 1971
12. Local and State Building Codes
13. All requirements of the Authority Having Jurisdiction (AHJ)
14. Local rules and interpretations required by the Authority Having Jurisdiction.

1.4 FIRE ALARM CONTRACTOR QUALIFICATIONS

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications, Preferred Experience: Firm with minimum 5 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel, Preferred Experience: At least 2 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
   4. Contract maintenance office located within 50 miles of project site.
   5. Certified in Washington as fire alarm installer.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

D. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.

E. All control equipment must have transient protection devices to comply with UL864 requirements.

1.5 SUBMITTALS

A. Prepare and submit shop drawings and catalog cut sheets for approval within the time period as stated in the General Conditions. Drawings shall first be submitted to the Authority Having Jurisdiction for approval. Upon receipt of this approval, drawings and catalog cut sheets shall then be submitted as stated in the General Conditions. Contractor shall not start any construction or order any materials prior to acceptance and approval of all submittals. Partial submittals are unacceptable. Submittals, as a minimum, shall include the following:
   1. Floor plans drawn with same size and scale as the Contract Drawings. Drawings shall indicate device locations, raceway/wire routing, riser diagrams, conduit and wire size, wire identification numbers, room and floor identification numbers.
   2. Point to point wiring diagrams of the control panels, remote annunciator panel(s), and terminal cabinets showing all installed wiring (not factory wiring harnesses) and connection of all fields wiring to the units.
   3. Detailed mounting installation diagrams of the control panel(s) and remote annunciator(s).
   4. Battery calculations.
   5. Riser diagrams with circuit identification labels, terminal wire identification, conduit and wire size, and device locations (with room names and numbers).

6. Operational description of the system, or a schematic ladder type logic diagram (Test and Control Matrix).
7. Nameplates and messages on the control panel(s) and annunciators shall be provided in actual size.
8. Wiring diagrams for all connections to interposing relays, control panels, HVAC equipment, elevator recall and other systems.
9. The Contractor shall provide NICET III or higher cert. and manufacturer cert.
10. The Contractor shall submit a written acceptance test procedure for approval by the Owner's representative.

1.6 CONSTRUCTION DRAWINGS

A. While the system installation is in progress, one set of shop drawings will be kept at the job site. This set will be designated as the construction drawings and will be updated each working day to reflect current as-built information. One set of construction drawings can be replaced with a fresh updated set of drawings but there shall never be more than one active set of construction drawings. The Owner's representative shall be given access to this set of construction drawings at all times so that progress may be reviewed and copies may be made. At the end of the project these marked-up construction drawings shall be submitted as part of the as-built drawings.

1.7 FIRE ALARM WIRING SYSTEM

A. Wiring shall be in accordance with Article 760 of the National Electrical Code and Local Electrical Codes.

1.8 PERMITS

A. This Contractor shall be responsible to obtain required fire alarm system construction permits, Shop Drawing approvals and final approvals from Authority Having Jurisdiction (AHJ). This Contractor shall furnish and install all required fire alarm system equipment imposed by AHJ at the Shop Drawing review and final system acceptance test period.

1.9 FIRE ALARM MONITORING

A. Provide connection to Owner designated central monitoring service. Communicator shall report separately each alarm point to the monitoring service.

1.10 WARRANTY

A. The entire fire alarm installation shall be warranted for one-year against defective equipment, materials, and workmanship.

B. Emergency warranty service shall be available within four-hours of a request 24-hours a day. The warranty period is to begin on the date the owner accepts the system.

1.11 POWER REQUIREMENTS

A. The control panel shall receive 120V AC power via a dedicated circuit.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120V AC power in a normal supervisory mode for a

period of 24-hours with 10-minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

C. All circuits requiring system operating power shall be 24V DC and shall be individually fused at the control panel.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment shall be new. Previously used equipment or discontinued models shall not be acceptable unless specifically identified elsewhere in this specification.

2.2 MANUFACTURER

A. The fire alarm control equipment shall consist of a system assembled as an approved unit of regularly manufactured components, by a single manufacturer for the purposes described elsewhere in this specification. Interconnecting equipment that has not been listed for interconnection or the creation of components or system into a non-standard unit that is not normally available from the manufacturer is not acceptable.

B. All equipment shall be listed, cross listed and labeled by Underwriters' Laboratories or approved by Factory Mutual.

C. Providing they meet all specifications; control panels and related equipment shall be manufactured by:
   1. Fire-Lite
   2. Silent Knight.
   3. Or other reviewed and approved Manufacturers.

D. All fire alarm control units shall be made by the same manufacturer.

E. All initiating devices and notification appliances shall be made from the same manufacturer. All initiation and notification devices shall be from the same manufacturer as the control units unless noted otherwise.
   1. In residential unit Smoke/CO combo: BRK First Alert Part #SC9120LBL
   2. In residential unit Smoke only: BRK First Alert Part #9120LBL

2.3 LOCKS

A. Locks for cabinets and enclosures shall be keyed.

2.4 EXCEPTIONS

A. Exceptions or substitutions may not be made to any specified or named product unless "or approved equal" is included in the specification. See spec Division 01.

2.5 FIRE ALARM CONTROL PANELS (FACP)

A. FACP shall incorporate power supplies, and all controls for the system except as described elsewhere within the specification. All components shall be mounted within a steel enclosure with locked door(s). Door(s) shall incorporate a transparent window for viewing indicator lights, and other pertinent components.

Provisions shall be made in or near the FACP for storing connection and schematic wiring diagrams, and emergency operating plans.

B. Fire alarm panel shall be equipped with a built-in Ethernet connection for UL monitoring and emailing status of the fire alarm system.

C. Fire Alarm System, including FACP, shall be wired for "Class B" operation on and signaling (Evacuation) circuits.

D. All controls shall be labeled; all zone locations shall be clearly identified. Submit wording for approval as a part of the contractor's submittal package documents.

E. Power Supplies:
   1. The emergency or standby 24V DC power supply shall contain standby batteries and automatic charger with the following requirements:
      a. Sealed gelled cell type batteries.
      b. 24-hour system backup capability plus 5-minutes of full alarm operation at the end of the 24-hour period.
      c. Charger shall be able to restore batteries to full charge within 24-hours after a complete discharge.
      d. Battery and charging system shall be supervised, including trouble annunciation of high/low voltage, shorted cell and open circuits.

2.6 REMOTE LCD ANNUNCIATOR(S) –

A. Annunciator shall consist of an 80 Character, backlit, alphanumeric liquid crystal display (LCD). Information shall be presented in clear, descriptive English language and includes: point status (alarm trouble), etc.); alarm type (smoke detector, manual station, etc.); number of system alarms, supervisory conditions, and trouble conditions; and a custom location label.

2.7 NAC BOOSTER POWER EXTENDER

A. Provide NAC booster extender if the new fire alarm panel will not have enough NAC circuits for this project.

B. The NAC Booster Power Extender panel shall be a stand-alone panel capable of powering a minimum of (6) notification appliance circuits that can be programmable for synchronized notification appliance and door holders circuits. Notification appliance circuits shall be Class-B Style-Y rated at 3 amps each. All new notification and visual devices shall be synchronized.

C. The internal power supply and battery charger shall be capable of charging up 12.7Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.

D. The NAC booster extender panel may be mounted close to the host control panel or can be remotely located. Using addressable point and relay modules the NAC booster extender panel can be connected to the addressable fire alarm panel.

E. When connected to a conventional (non-addressable panel) (1) or (2) standard notification appliance circuits from the main control panel may be used to activate all the circuits on the NAC booster power extender panel.

F. Alarms from the host fire panel shall signal the NAC booster power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

2.8 ALARM NOTIFICATION DEVICES

A. Audio Notification Appliance:
   1. Horn: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA at 24V DC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings.
   2. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with selectable minimum flash intensities of 15cd, 30cd, 75cd, and 110cd. Strobe intensity setting shall be visible with appliance cover installed for field verification of the Visible/Only appliance.
   3. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA at 24V DC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.
   4. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
   5. Weather-proof Combination Audible/Visible:
      a. Hermetically sealed for moisture proof or dust proof installations. This device is provided with a special weather-proof back box with 3/4" conduit threads for attachment of conduit. For indoor or outdoor use when watertight seal is required, use weather-proof boxes.
      b. UL listed For NEMA-4X
      c. Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA at 24V DC.
      d. Provide water tight conduit, wiring, and connections as required for weather-proof area.
   6. The Accessories: The contractor shall furnish any necessary accessories.
   7. Audio/Visual units shall be RED color.

B. Provide additional NAC power supplies as required for audio/visual circuits and 24VDC door holder circuits. Coordinate voltage for door holders with Electrical and Door Hardware Contractor.

2.9 AUTOMATIC CONTROL DEVICES

A. Magnetic door holders: Semi-flush wall mounted electro-magnet and door mounted armature with adjustable contact plate, designed to fit either ordinary or wall-recessed smoke doors.

1. Provide electro-magnets with force of attraction of 25 LBS when energized, and less than 3 LBS residual with power disconnected.
2. Armature contact plates: Horizontal adjustment of 95 DEG and vertical adjustment of 5 DEG.
3. Holding force of holder release totally electromagnetic and without use of mechanical linkage or other moving parts.
4. Normally energized with release accomplished by interrupting circuit.
5. Controlled automatically by fire alarm system programmable NAC 24VDC Circuit to door holder or control module for 120VAC door holder. Coordinate voltage with Electrical Contractor
6. Operating voltage: 24 VDC, 4 W, maximum powered from NAC booster panel or Fire alarm panel or 120VAC if coordinated with electrical contractor.
7. Connect to operate automatically in all zones on initiation of general or evacuation alarm.
8. When doors in open position do not reach wall magnet, provide chain extension of approved size with satin chrome finish between door and door armature to permit armature to engage wall magnet.
9. Provide proper power supply.
10. Provide as indicated in Specification Division 08 and/or on hardware schedule.

B. Addressable Relay/Control Modules:
1. Allows FACU to control a remotely located Form "C" contact (e.g., HVAC fans, dampers, fire shutters, elevator capture).

2.10 ADDRESSABLE DEVICE TYPES

A. General:
1. The system control panel, over its two wire multi-drop channel, must be capable of communicating with the types of addressable devices specified below.

B. Addressable Spot Type Smoke Detectors:
1. The Photoelectric type detector shall be a plug-in unit, which mounts to a twist lock base, and shall be UL listed.
2. The detectors shall be of the solid-state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear airflow entry.
3. The detector shall fit into a base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable Monitor Modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable Zone Adapter Module.
4. There shall be no limit to the number of detectors or Monitor Modules, which may be activated, or "in alarm" simultaneously.

C. Addressable Heat Detectors:
1. Thermal detector heads must be UL listed. They shall be rate compensated type, and available in 135degrees F and 190 degrees F temperature rating.

D. Addressable Pull Stations:

1. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the control panel over two wires, which also provide power to the pull station. The address will be set on each station. The stations will be manufactured from high impact red Lexan. Lettering will be raised and painted white. The station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations shall be double action.
2. The front of the station is to be hinged to a back-plate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations, which use allen wrenches or special tools to reset, will not be accepted. The station shall consist of high impact Lexan, red in color.
3. The addressable manual station shall be capable of field programming of its "address" location on an addressable signaling line circuit.
4. There shall be no limit to the number of stations, detectors, or Monitor Modules, which may be activated or "in alarm" simultaneously.
5. The addressable manual station shall be Underwriters' Laboratories Inc. listed.
6. Provide pull stations with protective shield and NEMA-3R on special locations (outdoor area). Protective shield shall be equipped with horn and battery suitable for surface-mounted.

E. Addressable Photoelectric Duct Detector:
1. The detector shall be non-polarized, 4-wire, 24V DC analog addressable type, which is compatible with the Fire Alarm Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. Auxiliary power shall be supervised by means of UL approved end of line relay.
2. Detectors shall be of the solid-state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible particles or smoke densities that are below the factory set point. No radioactive material shall be used.
3. The detector head shall be directly interchangeable with an ionization detector type. The 24V DC detector may be reset by actuating the control panel reset switch.
4. Detector construction shall have a mounting base with a twist lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory current of the fire alarm detection loop and cause a trouble signal at the control panel. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.).
5. It shall be possible to alarm the duct housing by using a test switch.
6. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
7. To minimize false alarms, voltage and radio frequency (RF) suppression techniques shall be employed as well as a smoke signal verification circuit and an insect screen.
8. Auxiliary single pole double throw (SPDT) relays.

9. Provide an accessible below ceiling or wall mounted remote LED alarm indicators and key operated test stations shall be installed for all duct detectors above ceiling, hard to access spaces, or as required by codes and AHJ.

F. Projection Beam Smoke Detectors:
1. Detector coverage range shall be 30 to 350’. The UL listed spacing for smooth ceilings is 60’.
2. Internal pointability adjustment range shall be +/- 10 degrees vertical and +/- 90 degrees horizontal.
3. Detector shall be provided with 6 sensitivity settings.
4. Detector shall be equipped with form “A” and form “C” alarm contacts, and form “B” tamper/trouble contacts.
5. Additional features are to include: Built in power supervision, automatic signal synchronization, automatic environmental compensation and bore sight alignment.
6. Detectors are to be UL, ULC, FM and CSFM approved.
7. Remote test/display panels shall allow remote testing and resetting. Panels are to indicate normal, trouble and alarm.

G. Addressable Sensor:
1. The addressable smoke sensors shall be of the photoelectric or ionization type and shall communicate actual smoke chamber values to the system control panel.
2. The addressable temperature sensors shall sense within a temperature range of 32° F. to 158° F. The control panel will be capable of sensing either a set point of 135° F., or a rate-of-rise of 15° F. per minute for fire sensing. For utility sensing, a set point may be chosen within the stated range and the control panel programming will be capable of using that information to determine specific response such as warning of failure of local temperature controls.
3. The sensors shall be listed to UL Standard 268 and shall be documented as compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.
4. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors that do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.
5. Sensor bases shall be provided with a relay driver output that is to be controlled either automatically or manually from the control panel.
6. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
7. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.
8. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

H. Monitor Module:
1. Monitor Modules on plate shall be used for monitoring of water flow, valve tamper, non-addressable detectors, and for control of evacuation indicating appliances and AHU systems.
2. An addressable monitor module shall be provided for interfacing normally open direct contact devices to an addressable signaling line circuit.
3. Monitor Modules shall be capable of mounting in a standard electric outlet box. Monitor Modules shall receive their 24V DC power from a separate two wire pair running from an appropriate power supply.
4. Use mini monitor modules only behind the local device.

I. Module Functions:
1. For conventional 2-wire smoke detector and/or contact device monitoring with Style-B or Style-D (NFPA 72 initiating device circuit) wiring supervision.
2. This type of addressable device module will provide power to, and monitor the status of a zone consisting of conventional 2-wire smoke detectors and/or N/O contact devices. The supervision of the initiating device circuit wiring will be Style-B. These modules will communicate the zone's status (normal, alarm, trouble) to the control panel.
3. For conventional 4-wire smoke detector and/or contact device monitoring with Style-B or Style-D (NFPA 72 initiating device circuit) wiring supervision.
4. This type of addressable device module will provide power to and monitor the status of a zone consisting of conventional 4-wire smoke detectors and/or N/O contact devices. The supervision of the initiating device circuit wiring will be Style-B and/or Style-D as also identified in the Schedule on the Plans. The module will provide detector reset capability and a 2A fuse to provide over current power protection for the 4-wire detector. These modules will communicate the zone's status (normal, alarm, trouble) to the control panel.
5. For alarm notification appliances, and other device control with Style-Y or Style-Z wiring supervision.
6. This type of addressable device will provide double pole double throw relay switching that can be used to connect through easily replaceable 2A fuses: A circuit of alarm notification appliances to a power source; or activate a variety of controlled devices. The module will be available in either a Style-Y or Style-Z supervision version. In the Style-Y version, an end of line device will supervise the wiring. In the Style-Z version, the wiring will be looped back and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break. These modules will communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and will receive a command to transfer the relay from the fire alarm control panel.
7. For non-supervised control.
8. This type of addressable device will provide double pole double throw relay switching for loads up to 120V AC. It will contain easily replaceable 2A fuse, one on each common leg of the relay.
9. The module shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the module

become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.

10. The module shall be capable of being programmed for its "address" location on the addressable device signaling line circuit. The module shall be compatible with addressable manual stations and addressable detectors on the same addressable circuit.

J. Conventional All Weatherproof Rate Compensation Heat Detector:
   1. Hermetically sealed for moisture proof or dust proof installations. Requires no special back box. Has plastic hexagonal grip bushing with 3/4" conduit threads for attachment to threaded hub cover, or any outlet box. For indoor or outdoor use when watertight seal is required, use weatherproof box.
   2. Provide weatherproof deep j-box with cover for all exterior devices.
   3. Provide addressable mini point module inside weatherproof j-box.

K. All devices will be supervised for trouble conditions. The system control panel will be capable of indicating the type of trouble condition (open, short, device missing/failed). Should a device fail, it will not hinder the operation of other system devices. Should a problem occur on a particular wire run, it will not affect other wire runs.

2.11 SPRINKLER

A. Provide all addressable modules and connections and interface requirements for fire alarm system supervision and alarm of fire sprinkler system.

2.12 COMBINATION SMOKE FIRE DAMPERS

A. Provide connections to operate all combination smoke fire dampers, existing and new.

2.13 SPARES

A. In addition to spare capacities and equipment listed in other portions of this specification, the following spare components shall be provided and installed in the FACP cabinet.

B. Smoke Detector Head – Five.

C. Addressable Mini Input Point Module - Five.

D. Addressable Input Point Module - Five.

E. Addressable Relay Module - Five.

F. WP Wall Horn/strobe – Five.

G. Fuse – Five.

2.14 CENTRAL STATION COMMUNICATIONS:

A. Provide connection to Owner designated central monitoring service. Communicator shall report separately each alarm point to the monitoring service. Provide connection between the fire alarm Ethernet communicator and owner data network.

B. Owner wants to be able to monitor the building from cell phone or tablet. Provide special programming to email alarms and troubles to maintenance department personal as required by owner. Coordinate all work with owner.

C. Coordinate location of data network and requirements with Owner.

D. The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (UDACT) for signaling to Central Station via AES Radio wireless transmitter.

E. Provide current AES Radio panel with interface module to capture the Digital Alarm Communicator.

F. Provide minimum 5dB Omni Directional antenna, mounting bracket as required, and 100-feet of antenna cable to route remote antenna to mount in catwalk or roof.

G. The DACT shall contain a “Dialer-Runaway” feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers.

H. The fire department shall be consulted as to authorize central station companies serving municipality.

I. The fire alarm system shall transmit alarm, supervisory, and trouble signals with alarm having priority over trouble signal.

J. The contractor shall be responsible for installation charges, while the owner shall be responsible for line lease charges.

K. Provide central station monitoring point list for the final inspection.

2.15 GRAPHIC MAP

A. Graphic map shall be mounted adjacent to the Annunciator. Map shall consist of a 1/16” = 1’ scale floor plan graphic rendering of the building with rooms identified by names or number and all fire alarm system equipment, alarm and supervisory devices point addresses.

B. Map shall be silk-screened on an anodized aluminum face with ultra-violet protection paint, and shall be enclosed behind a polycarbonate viewing pane, with a brushed stainless steel frame and tamper resistant stainless steel screws.

2.16 FIRE ALARM DOCUMENTS STORAGE CABINET

A. Provide fire alarm documents storage cabinet adjacent to main fire alarm panel per NFPA-72 2019 code.

B. Coordinate location with Architect or Owner prior to installation.

C. Download program data and point list onto the 4GB flash drive built-in to cabinet per NFPA-72 2019 code.

D. Manufacturers:
   1. Space Age Electronic Part Number SSU00685 or equal. Coordination location of storage cabinet in field with Owner.

2.17 PRIMARY 120VAC POWER PROTECTION DEVICE

A. Provide primary 120VAC power circuit lockout kit per NFPA 2019 code.

B. Manufacturers:
   1. Space Age Electronic Part Number ELOCK_FA or equal.

2.18 NAMEPLATES AND LABELS

A. Manufacturers:
1. Marking Services, Inc. (MSI): http://www.markserv.com.
2. Double O Laser Services, Inc. http://www.doubleolaser.com.
3. Or approved equal.

B. Fire Alarm Main Control Panel, Fire Alarm Subpanels, and Duct detectors Nameplates: Engraved plastic, high contrast for maximum visibility. 1/16" engraving plastic with mounting adhesive backing.
1. Fire Alarm Panels: White letters on Red.

Description:	Example:
Panel Name:	**MAIN FIRE ALARM**
Node #:	**Node 10**
AC PANEL:	**AC Panel 2X2A**
BREAKER #:	**Breaker #34**

2. Duct Detector Locations: 3/8" White letters on Red 1"x3" plate with 1/2" letters. Install on the grid next to the ceiling tile to gain access to the duct detector. Mount in clear sight of the floor.

Description:	Example:
Device Name:	**DUCT SLC1-S26**

3. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use for identification of all fire alarm input and output control devices. In clear sight of the floor. Otherwise provide a duct detector type label. These address label shall match fire alarm readout and as-built drawings. All module devices shall have a description of what it is monitoring and controlling.

Description:	Example:
Device Name:	**N10SLC1-S26**

PART 3 - EXECUTION

3.1 APPROVAL

A. No equipment shall be provided at the job site until shop drawings have been reviewed and approved by the Authority Having Jurisdiction. An approved shop drawing set shall be continuously available at the job site during construction.

3.2 MOUNTING POSITION

A. Evacuation horns and strobes shall be mounted in accordance with UL Standard 1971 and Authority Having Jurisdiction requirements.

B. Fire Alarm Duct Detector shall be mounted in accordance with UL Standard 268A, NFPA90, NFPA 92A&B, NFPA72, and Authority Having Jurisdiction requirements.
1. Fire alarm duct detectors are require for all HVAC unit 2000CFM or above per code and AHJ. Fire alarm duct detectors are typically supervisory alarm mode, but some local AHJ want alarm mode. Coordinate what mode the AHJ wants for this site prior to final programming and inspection.

2. If possible in large HVAC units mount duct detector inside the HVAC unit.
3. Location of the fire alarm duct detector shall be mounted minimum of 3-feet in or on air ducts shall be downstream from any duct openings, deflection plats, sharp bends or branch connections.
4. This detail shows the shutdown of HVAC unit upon fire alarm duct detector alarm or supervisory mode as required to be controlled by code.
5. Fire alarm contractor to provide duct detector to mechanical contractor to be install and electrical contractor wire all connections to the HVAC units and duct detectors.
6. Mount duct detectors per code and in accessible space. Provide remote test/led annunciator for any duct detector that is above drop ceiling and has hard access.
7. Provide nameplate per spec 28 31 00 para 3.4 on access point and next to drop ceiling tile.
8. Provide a written detail description of each duct detector location to direct a person to that location in the closeout documents.

3.3 MOUNTING METHODS

A. Conduit, panels, devices and boxes shall be secured by means of expansion shields in concrete, machine screws on metal surfaces and wood screws on wood construction. Attachment with devices driven in by power charge or nail type nylon anchors are not acceptable in lieu of machine screws.

3.4 WIRING

A. Provide plenum-rated cable for all cabling.
   1. The manufacturer's recommendations shall only be used as a minimum requirement.
   2. Exception to plenum-rated cable is underground-rated cable when fire alarm cabling leaves the building. Provide protect per manufacture requirements.
   3. All conduit shall be minimum EMT 3/4” unless otherwise noted.

B. General Wiring System:
   1. All wire shall be new, UL approved and marked, and brought to the job site in original packages.
   2. Wire insulation shall be one of the types required by NEC. All wires shall be sized per the NEC for the load serviced. Field wiring for initiation, supervision and signal circuits shall be solid conductor. All wire shall be rated at 105 degrees C and be approved for fire alarm installations.
   3. Twisted wire shall twists per foot rate in accordance with equipment manufacturer's requirements.
   4. Aluminum wire is prohibited.
   5. Wire pulls by powered mechanical means will not be permitted. Conduit shall be thoroughly cleaned of all foreign material just prior to pulling the wire or cable. Lubricants shall be compounds specifically prepared for cable pulling and shall not contain petroleum or other products, which will affect cable insulation.
   6. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used and shall be removed.
   7. Low voltage energy limited wiring shall not be run in the same wireways with or closely parallel to high voltage and/or switched power wiring.

8. Interposing relays shall be used for all switched power loads and shall be located such that the switched power conductors do not run in the same wireway as the interposing relay coil power or any other energy limited low voltage conductors.
9. No wire run or circuit shall be longer than 80 % of the maximum allowable length and power consumption for the wire size and application. No alarm input/output circuit shall exceed 80 % of the maximum load capacity specified by the manufacturer.
10. Splicing shall be minimized and shall be accomplished only in accessible outlets, junction, or cabinet boxes, which are clearly indicated on the as-builts.
11. All wiring for each floor shall be terminated in a terminal cabinet prior to running the wires to the fire alarm panel. Provide at least one terminal cabinet for each floor in each building.
12. All solid wire terminations shall be made bare to screw terminals specifically designed for bare wire connection. All stranded wire terminations shall be made with T&B "Sta-Kon" (or equivalent) self-insulated, spade lugs where connected to screw type terminals.
13. Wiring in all cabinets and terminal boxes shall be neatly arranged and bundled with tyraps or equivalent.
14. Wires shall be numbered at each connection, termination, and junction box.
15. All conductors shall be tagged, labeled, and color coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color-coding shall be continuous for each circuit wire. Tag numbers shall agree with wire numbers assigned on manufacturer's wiring diagrams and the installation wiring diagrams and drawings.

3.5 AUXILIARY CONTROL WIRING

A. Conductors and power supplies of sufficient size shall be installed to minimize voltage drop consistent with the proper operation of all devices, including spare device requirements as hereinbefore specified.

3.6 AUXILIARY CONTROLS

A. Provide all raceways, conductors and auxiliary relays to control the following:
   1. HVAC units shunt down.
   2. Smoke fire dampers.
   3. Door holders.
   4. Door Release.
   5. Elevator recalls.
   6. Access control unlocks or release.

3.7 VISUAL ALARM APPLIANCES

A. Provide visual alarm appliances with sync and light output intensity to comply with room size in accordance with NFPA 72, Table.

3.8 AUDIO ALARM APPLIANCES

A. Provide audio alarm appliances with temporal and to be 15db above ambient sound level of the room accordance with NFPA 72, Table.

3.09 SMOKE DETECTORS

A. Locations of smoke detectors indicated on Drawings are approximate. Install detectors with spacing in accordance with NFPA 72 and the Authority Having Jurisdiction. Adjust locations to coordinate with other equipment, sprinkler, light fixtures, air diffusers. Locate smoke detectors 36" away from air handling diffusers and 24 " from light fixtures. Distance between detectors shall not exceed their listed spacing. Detectors indicated on sloped ceilings shall be located within 3' horizontally of the highest point of the slope.

3.10 PROGRAMMING

A. Program system to for complete operation to the satisfaction of the Authority Having Jurisdiction. Program all addressable devices to correspond with final room identification/numbering. Verify room identification with the Owner's representative.

B. Factory default install code will not be changed.

C. Program owner code to 1111

D. Program the options to access date & time, smoke status, event log, and add devices.

3.11 DOCUMENTS

A. As a condition for the project final acceptance, the Contractor shall, prior to final testing, submit the following documents to the Owner's representative for approval. If as a result of final testing there is a change to the system design, then the Contractor shall correct the as-built drawings.

B. Record Drawings:
   1. Provide as built record drawings indicating the completed installation. Drawings shall be prepared on approved shop drawings with changes marked in red pencil, in a legible and neat manner. Drawings shall indicate locations of: fire alarm devices, junction boxes, terminal cabinets, sensors and controlled equipment (motor starters, fans, pumps, valves, dampers, etc.). Drawings shall indicate: Riser diagrams, sources of power, raceway sizes and routing, type and number of conductors.
   2. As-built panel schematic, connection and interconnection wiring diagrams showing all system components. Trunk type wiring diagrams are not acceptable.
   3. Component connection diagrams shall show schematic point-to-point identification (Test and Control Matrix).
   4. Central station monitoring pre-test report of all new addressable points.

C. Provide the AHJ at final acceptance the following documents:
   1. As-built drawings shall be full construction set with redline markups that contain the following (all zoning, device point numbers, new device conduit or wiring pathways, and exact location of devices and panels.)
   2. Central station monitoring pre-test report of all new zones.
   3. Fire alarm panel alarm, supervisory, and trouble event log report of all devices.
   4. Addressable points list for bldg.
   5. Completed NFPA 72 Record of Completion current forms to owner and AHJ.

6. Provide digital copy of all above on one following (cd-rom, dvd, or finger drive).
7. Provide all the above documents in O&M manuals binder.

D. Operation and Maintenance Manuals:
1. Manuals shall contain cut sheets of all equipment and devices installed, wiring diagrams, operational and maintenance instructions. All device options shall be clearly identified. Refer to Section 16010.
2. Manual shall contain all documents in Section 283100 Paragrah 3.11c
3. Contractor to provide O&M Manual binder at each fire alarm panel locations.

E. Functional Description For Auxiliary Controls:
1. When an interface exists between the FA system and other control systems or controlled devices, the contractor shall provide a complete narrative describing operational relationships to the FA system.

3.12 TESTING

A. The completed system shall be subjected to two required tests. The initial test shall be a preliminary test, which will be witnessed by the Owner's representative. This test shall be completed after the system has been on line for a minimum of seven-days. Should the results not be satisfactory to the Owner's representative's representatives, then corrections will be made and a re-test will be required at the Contractor's expense. A Contractor's representative and Contractor supplied fire alarm technician shall be present for all testing. The fire alarm technician shall conduct the tests.

B. After satisfactory completion of the preliminary testing, the Contractor shall arrange for the Authority Having Jurisdiction to witness a final acceptance test of the system. The Authority Having Jurisdiction will grant final acceptance. Approval of the Authority Having Jurisdiction shall be evidenced in writing and a copy forwarded to the Owner's representative.

C. The following items and procedures will be required as a minimum for the preliminary testing of the system:
1. Bypass and control switches shall be operated to indicate proper supervision of the switch.
2. Valve and sprinkler supervision switches shall be operated to verify proper response.
3. Valve and sprinkler supervision switches shall have one wire removed to verify proper supervision.
4. Each alarm output, detection or supervision zone may be tested for proper response to ground conditions.
5. AC power shall be interrupted to see if the system will operate on batteries. Audible devices shall operate for 30-minutes on battery power.
6. All critical fuses shall be removed to check for proper supervision.
7. Detectors shall be tested for alarm operation.
8. Flashing light units will be tested for wiring supervision by removing a wire from the device. The device will also be tested for proper alarm operation.
9. Alarm sounding devices will be tested for proper operation.
10. Audibility tests will be conducted by the Contractor to determine compliance with the dBA requirements.

3.13 TRAINING

A. The Contractor shall, after two-weeks (minimum) written notification to the Owner's representative and conduct two training sessions of not less than four-hours length in each session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the Owner's representative. A manufacturer's representative thoroughly familiar with the characteristics of the installed system shall conduct the session.

3.14 PROJECT COMPLETION

A. Project completion and payment will be based on completion of the following:
   1. Completion and approval of acceptance tests.
   2. Completion of punch list items.
   3. Delivery and acceptance of the as-built drawings and operation and maintenance manuals.
   4. Provide cd-rom, dvd, or finger drive of program data in fire alarm panel as required by NFPA-72 codes.
   5. Clean-up of installation site to the satisfaction of the Owner's representative.

END OF SECTION

SECTION 28 50 32

TELEPHONE ENTRY SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included
   1. Furnish, install, test, and make fully operational, the specified equipment to provide a fully functional PC programmable telephone entry system.
   2. Integrate the telephone entry system into Owner's access control system. Coordinate requirements with Owner on selected system.
   3. Contractor is to provide one telephone for each dwelling unit for use with the access control system.
      a. Telephones provided in Type A units shall be text telephone (TTY) communication enabled per the 2010 Americans with Disabilities Act (ADA) requirements section 708.4.2

B. Related Work
   1. Section 27 10 00 Telecommunications System

1.2 BASIC DEFINITIONS

A. Abbreviations:
   1. ACAMS: Access Control and Alarm Monitoring System
   2. SVS: Security Video System

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Provide an equipment list identifying the model numbers of all devices/equipment and the quantities of each type of device.

C. Shop Drawings shall be provided giving details of proposed system architecture and the work to be provided. Include riser diagrams, plans, elevations, sections, details, point to point drawings of system, individual device wiring diagrams and attachments to other work.

1.4 WARRANTY

A. Provide 1-year guarantee on all equipment installed under this contract.

B. Make available fully qualified repair and maintenance personnel on a 24-hour a day basis, 365 days a year, with 4-hour maximum response time for service during normal business hours.

C. Provide normal service at no additional cost Owner during normal business hours.
   1. Normal service is defined as minor repairs and/or adjustments or any service that the system requires in order to be fully functional that does not fall into the category of Emergency Service, at the option of Owner.
   2. Normal service is additionally defined as being provided on a same-day basis. Same-day service is required for service calls requested by phone

before 1:00 p.m. on a weekday and on the next working day if requested after 1:00 p.m. on a weekday.

D. Prior to filing the Notice of Completion, system maintenance is the sole responsibility of Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Door Entry System
   1. Manufacturers: Provide products by the following:
      a. Door King Telephone Entry System 1834 Flush
      b. Or approved equal.

B. In-Unit Phones:
   2. Manufacturers: Provide products by the following:
      a. Type-A & Type-B units: Cortelco Trendline 6150
      b. Hearing impaired units: CapTel 840
      c. Or approved equal.

2.2 GENERAL SYSTEM REQUIREMENTS

A. Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specific functions.

B. The system shall be a no phone bill telephone entry system that connects directly into each resident apartments telephone line and uses these lines to provide voice communication between each resident’s apartment and the door entry system.

C. The system shall have the capability to increase the number of stations by 25% above those currently indicated without having to add any new internal or external components or main truck cables/conductors.

D. The system shall be a modular type that uses solid state components. It shall be fully rated for continuous duty unless otherwise indicated. The equipment shall operate on input power usually supplied at 110 to 130V, at 60 Hz.

E. For units that are installed outdoors, in damp locations, or where exposed to weather. Install device(s) consistent with the manufacturer’s waterproof ratings. The device shall be listed and labeled by a nationally recognized testing laboratory (NRTL) for use outdoors or in damp locations.

F. The system shall have battery back-up. The batteries will be sealed and sized to provide complete battery backup of all systems plus a minimum of 25% spare capacity for a continuous run time of no less than 24 hours during a loss of power.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Furnish and install DoorKing telephone intercom system. Telephone Intercom system shall be fully functional with each dwelling unit telephone.

3.2 SYSTEM TESTING

A. Functionally test the Telephone Entry System to insure that all components of the system are operating properly in accordance with the manufacturer's criteria.

B. Test each connection at each individual residential unit to ensure each location is programmed and operational.

C. In areas where CAT 6 Twisted Pair (UTP) Wiring is used
   1. The Category 6 cable runs shall be tested for conformance to the specifications of EIA/TIA 569-C Category 6 and must be tested for:
      d. NEXT
      e. PS NEXT
      f. Attenuation
      g. Continuity
      h. Insertion Loss
      i. Distance
      j. Delay Skew
      k. ACR
   2. Any pairs not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to the owner.
   3. Complete, end to end, test results must be submitted to the Owner prior to any request by Contractor to have the Owner sign off the project.
   4. Verify and test all Category 6 cables with a Level III tester. The testing device must be approved by the owner prior to use. Failure to gain approval is at contractors own risk.
   5. All test results shall be submitted to the Designer and Owner one week prior to move in. Test results shall be submitted in electronic format.
   6. Factory manufactured CAT6 jumper cables do not require field testing.
   7. Provide a report that lists the resident location tested, the results, and any measures taken to fix any item that was found to not to be functioning properly.

3.3 WARRANTY SERVICE

END OF SECTION

SECTION 32 31 13

FENCING AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Chain link fencing and gates, height as shown on the drawings, plain black vinyl finish (coated), and standard 1-1/2-inch nominal fabric.
   2. Cantilevered rolling gates as shown on drawings.

B. Performance Requirements:
   1. The Owner has established environmental goals for this project. Refer to Section 01 81 13 for general requirements.

C. Project Specific Requirements: None

D. Related work
   1. Section 05 50 00 - Metal Fabrications
   2. Section 08 71 00 - Door Hardware.
   3. Section 09 90 00 - Painting and coating.

1.2 REFERENCES

A. UL Gate Operator Requirements (UL 325).

B. ANSI/ASTM A 123 - Zinc (hot dip galvanized) coatings on iron and steel products.

C. ANSI/ASTM F 567 - Installation of chain-link fence.

D. ASTM A 120 - Pipe, steel, black and hot-dipped zinc coated (galvanized) welded and seamless, for ordinary uses.

E. ASTM A 153 - Zinc coating (hot-dip) on iron and steel hardware.

F. ASTM F 668 - PVC coated steel chain link fence fabric.

G. ASTM C 94 - Ready-mixed concrete.

H. ASTM F573 - Residential zinc coated steel chain link fence fabric.

I. ASTM F 1234-90A - Electrostatic powder coating for piping and accessories (prefinish).

J. ASTM F 1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates

K. ASTM F 2200, Standard Specification for Automated Vehicular Gate Construction

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit cut sheets for fence components and automatic gate operator.

C. Operations and maintenance data: covering installed products and automatic gate operator. Manual to include parts list showing manufacturer’s names and part numbers for the gate operator.

D. Shop Drawing: Supply shop drawings showing the relationship of operating systems with gate components, including details of all major components.

E. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

F. Project record documents:
1. Section 01 70 00 – Execution and Closeout Requirements: Project Record Documents.
2. Accurately record actual locations of property perimeter posts relative to property lines.

1.4 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Requirements: Quality Control.

A. Qualifications
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
2. Installer: Company specializing in performing Work of this section with minimum three years experience and approved by manufacturer.

B. Certifications:
1. Gate in compliance with ASTM F 2200, Standard Specification for Automated Vehicular Gate Construction.
2. Gate operator shall be in compliance with UL 325 as evidenced by UL listing label attached to gate operator.

PART 2 PRODUCTS

2.1 CHAIN LINK FENCE

A. Manufacturers:
1. United States Steel (USS).
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Materials
1. Materials and Components: Conform to CLFMI Product Manual.
2. Fabric: Light industrial, vinyl coated, standard size 1-1/4” nominal, 9 gauge, top and bottom knuckle end closed.
3. Line Posts, corner and terminal posts: Type I round 2 7/8” O.D., vinyl coated, manufacturer’s standard.
4. Top and Bottom Rails: Type I round 1 5/8” O.D., vinyl coated, manufacturer’s standard.
5. Gate Posts: Type I round, 4” O.D.

C. Accessories
1. Caps: Dome Style, cast steel galvanized; nylon coated; sized to post diameter, set screw retainer.
2. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel galvanized.

2.2 CANTILEVER GATE

A. Listed Manufacturer: Tymetal Corp.
   1. Also accepted: Hoover Fence Co.
   2. Substitutions per 01 60 00.

B. System Function: System shall be designed to operate cantilever sliding gate(s). The gate operator shall be UL 325 Listed for Class III and IV.
   1. Gate shall have a minimum counterbalance length of 50% opening width.
   2. Intermediate vertical members shall be used - with spacing between verticals to be less than 50% of the gate frame height.
   3. Gate truck assemblies shall be tested for continuous duty and shall have precision ground and hardened components. Bearings shall be pre-lubricated and contain shock resistant outer races and captured seals.
   4. Gate truck assemblies shall be supported by a minimum 5/8” plated steel bolt with self aligning capability, rated to support a 2,000 lb. reaction load.
   5. Hanger brackets shall be hot dipped galvanized steel with a minimum 3/8” thickness that is also gusseted for additional strength.
   6. Gate top track and supporting hangar bracket assemblies shall be certified to withstand a 2,000 lb. vertical reaction load without exceeding allowable stresses.
   7. Number of gates and gate size per drawings.

C. Gate Frame:
   1. The gate frames shall be fabricated from 6063-T6 aluminum alloy extrusions. The primary members (top and bottom) shall be "P" shaped in cross section with no less than 2" on a side and weighing not less than 1.6 lb/lf.
   2. End vertical members of the gate frame are 2”x2”, weighing not less than 1.1 lb/lf. Interior vertical members shall alternate between 1"x1" and 1"x2" in cross section, weighing not less than .52 lb/lf and .82 lb/lf respectively.
   3. The gate is to be supported from the tracks by two (2) swivel type, self-aligning, 8-wheeled, sealed lubricant, ball-bearing truck assemblies.
   4. The lower rail shall be guided by a guide bracket on both posts. Each guide bracket will have a pair of guide wheels.
   5. Diagonal "X" bracing of 3/16" (5mm) minimum diameter stainless steel aircraft cable shall be installed to brace the gate panels and to provide a ready means of vertical adjustment.

D. Gate Filler:
   1. Chain Link: 1-1/2” x 1-1/2” x 9 gauge aluminized steel chain link fabric shall extend the entire length of the gate. Fabric shall be attached at each end of the gate frame by standard fence industry tension bars. ASTM F 2200 requires attachment method that leaves no leading or bottom edge protrusions.

E. Gate Finish:
   1. Gate to be coated with black polyester powder as specified by the design team. Gate posts (to be supplied by others) shall be powder coated as

specified by the design team. Reinforcement beam to be hot dip galvanized.

F. Posts:
1. Double set of support posts shall be 4” OD (102mm) galvanized steel with concrete footings as specified by the design team.
2. Bollard posts shall be 1/4” wall 8”x 8” square tube filled with concrete as shown in detail drawings, finish shall be hot-dip galvanized.

G. Gate Lock:
1. Gate system shall be furnished with a secure gate catcher. The catcher shall prevent the gate panel from being pried open while the gate is in the closed and locked position.

2.3 CANTILEVER GATE OPERATOR:

A. Listed Manufacturer: Lift Master.
1. Also accepted: Door King.
2. Substitutions per 01 60 00.

B. Gate Operator: Lift Master CSL24UL High-Traffic Commercial Slide Gate Operator.

C. The slide gate operator shall open and close cantilever gates, to provide convenience and security. This model is adapted to function with most accessories including: radio controls, electro-mechanical locks, single and three button control stations, digital keypads, coded cards, sensing loops. The operator utilizes 230 Volt AC single phase power. Control voltage is 24 Volt DC.

D. The gate operator includes **a** Controller with integrated radio receiver, plug-in loop detector capability, surge protection.

E. Capacity:
1. The gate operator shall be rated to operate a gate weighing up to 2500 lbs.

F. The gate operator shall be UL 325 compliant for Class III and IV.

G. Design Criteria:
1. Operation shall be by means of a 1HP motor.
2. Emergency manual operation shall be by means of an integral foldout hand crank.
3. The operator shall include a soft start, soft stop and adjustable speed feature.
4. The operator shall open and close the gate at a speed up to 24 inches per second.
5. Optional components:
a. Arctic Package - includes thermostatically controlled heater and artic gearbox oil.
6. Optional accessories, contact, non-contact, and control devices:

a. Control devices include pushbuttons, radio controls, keypads, card readers, key switches, telephone entry systems, and revenue control equipment.
b. Contact and non-contact devices include photoelectric sensors, vehicle detectors, proximity sensors, and contact edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify installation conditions as satisfactory to receive work of this section. Do not install until any unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F 567 and manufacturer's instruction.

B. Set all posts plumb, in concrete footings with top of footing 6" below finish grade. Slope top of concrete for water runoff. Alternately, if fence is installed after a concrete slab-on-grade has been installed, bolt to concrete using manufacturer's standard galvanized steel base plate and standard size galvanized bolts.

C. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

D. Provide top rail through line post tops and splice with 6" long rail sleeves.

E. Position bottom of fabric 2" above finished grade.

F. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15" on centers.

G. Attach fabric to end, corner, and gateposts with tension bars and tension bar clips.

H. Install bottom tension wire strap stretched taut between terminal posts.

I. Install gate with fabric as scheduled. Install three hinges per leaf. Gates to swing from gateposts.

3.3 LOCATIONS

A. As shown on plans on sheet A001.

3.4 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

END OF SECTION

SECTIONS 32 80 00

IRRIGATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes: Design and installation of new drip irrigation system circuits to provide irrigation to all new planting areas (shown on plans), warranty and maintenance.

B. Scope of irrigation system: The work shall consist of installation of all materials necessary for complete coverage including all irrigation equipment and all related equipment necessary for a complete drip irrigation system for new and renovated landscaped bed areas.

C. Coordinate work of this section with civil, mechanical and electrical contractors.

D. Confirm location of irrigation water source. Refer to civil utility drawing plans for water source locations.

E. Prepare design/build drawings for review by Owner's Representative.

F. Prepare and provide construction records and equipment catalog information.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
   1. Section 31 20 20 Earthwork
   2. Section 33 10 00 Water Distribution System
   3. Section 33 40 00 Storm Drainage System
   4. Section 32 90 90 Planting

1.3 PERFORMANCE REQUIREMENTS

A. Furnish, set and mark all line and location stakes, including offsets and general construction staking. Preserve all benchmarks and stakes. Replace any that are displaced or missing.

B. Review of records relative to the existing underground utilities. Call Utility Location Services for utility location. The Contractor is responsible for locating and avoiding damage to these facilities and shall restore all damaged utilities at his/her own expense.

C. Notify the Owner's Representative immediately if utilities not shown on the records are encountered.

1.4 SUBMITTALS

A. Product Data: Furnish catalog cuts or other descriptive literature, including current manufacturer's price lists, of all specified equipment and materials for acceptance by the Owner's Representative prior to installation. Equipment or materials installed or furnished without prior approval of the Owner's Representative will be rejected and such materials will be required to be removed and replaced with accepted materials at the complete expense of the Contractor.

B. Design/Build Drawings: Provide full-size (24" x 36") design/build plan for review by Owner's Representative a minimum of 10 days prior to installation. Work will not proceed without prior approval.

C. Record Drawings: Record all changes that have been made during actual installation of irrigation system components. Immediately upon installation of any piping, valves, wiring, sprinkler heads, etc., in locations other than shown on the original drawings, or of sizes other than indicated, clearly indicate such changes on a record set of drawings to be provided to the Owner's Representative. Coordinate these record drawing requirements with Section 01770 - Closeout Procedures.

D. Maintenance and Operations Manual: Provide three sets of all manufacturer's maintenance data sheets, replacement part lists, equipment brochures and systems operations information for all installed materials; bound in three-ring binders with the project name, date and contractor on front label. Composite data sheets shall have the specific product used on the project clearly identified in colored ink marking.

1.5 QUALITY ASSURANCE

A. Irrigation contractor/installer is required to be a Washington State licensed landscape contractor specializing in work of this section, with minimum of five years documented experience in irrigation installation of a similar nature.

B. Provide at least one person who shall be present at all times during execution of this portion of the work, who shall have a minimum of three years experience in irrigation installation and be familiar with the type of materials being installed and the proper materials and the methods for their installation, and who shall direct all work performed under this Section.

1.6 FLUSHING AND TESTING

A. Contractor is required to test system, observed by the Owner's Representative as follows:

B. Coverage Testing: After system is 100-percent installed perform a water coverage test to determine whether water coverage and operation of the system is adequate for planting, without areas of excessive flooding, dry spots areas of insufficient overlap, or overspray onto pavements. If system is determined by the

Owner's Representative to be inadequate due to Contractor's poor workmanship or materials, it shall be replaced or repaired at Contractor's expense and both pressure and coverage tests repeated until accepted.

1.7 FINAL ACCEPTANCE

A. Notify the Owner's Representative seven days prior to anticipated 100-percent completion of the irrigation installation, including controller programming. The Owner's Representative maintenance personnel will review the completed work. Final acceptance of the irrigation work in this section will be made by the Owner's Representative after a subsequent review to determine 100-percent completion of the Contract work, including punch list items, and issues requiring remedy as identified by the Owner and the Owner's landscape maintenance personnel. Final acceptance will not be granted incrementally for partially completed work unless authorized by the Owner's Representative. The date of final acceptance constitutes the beginning of the one-year warranty period.

1.8 SYSTEM FAMILIARIZATION

A. Upon acceptance of the system by the Owner's Representative, provide the necessary keys and other tools necessary to operate, drain, and activate the irrigation system. Allow sufficient time with King County Housing Authority's maintenance personnel to ensure familiarity with system operations, controls, maintenance, activation and winterizing procedures.

1.9 WARRANTY

A. Provide one-year written warranty against all defects of materials and workmanship. Irrigation equipment damaged by vandalism or resulting from Owner occupancy of the site will not be required to be replaced under this warranty, unless improper installation is a contributing factor in the damage.

B. Guarantee shall include restoration of planted or paved areas due to settlement of trenches.

C. Guarantee shall include one complete winterization and one complete dewinterization of the irrigation system.

D. Ensure and guarantee complete irrigation coverage of all landscape areas shown on the drawings. Guarantee the satisfactory operation of the new and renovated irrigation circuits. The new work will be guaranteed to be complete in every detail for a period of one year from the date of final acceptance of the work. Repair or replace any such defects occurring within that year, free of expense to the Owner.

E. Completion will be one year from start of warranty period.

END OF SECTION

SECTION 32 90 90

PLANTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All material, labor, services, and related items required to complete work indicated on Drawings and specified herein. The work includes installation of all plant materials - including trees, shrubs, groundcovers and lawn - and warranty and maintenance.

B. Related Sections: Coordinate related work specified in other parts of the Contract Documents, including but not limited to the following:
1. Section 12 93 90 Site Furnishings
2. Section 32 91 13 Soil Preparation
3. Section 31 20 20 Earthwork
4. Section 33 10 00 Water Distribution System
5. Section 33 40 00 Storm Drainage System

1.2 REFERENCE STANDARDS

AJCHN American Joint Committee on Horticultural Nomenclature Second Edition, 1942, and hereinafter called AJCHN. Conform to accepted nomenclature in the nursery trade for names not present in this listing.

ASNS American Standard for Nursery Stock issued by the American National Standards Institute.

1.3 SUBMITTALS

A. A complete list of plant and mulch materials and miscellaneous materials proposed to be furnished and installed, demonstrating conformance with the requirements specified in Section 01 33 00 - Submittal Procedures. Include names and addresses of nurseries and suppliers.

B. The source name and a ½-pound sample of mulch.

C. Submit documentation that the plant materials have been secured within 30 days of notice-to-proceed. Include documented orders or other approved documentation. This submittal does not preclude other acceptance and warranty requirements.

D. Qualifications of installers

E. Record Drawings: Record all changes that have been made during actual installation of plantings in locations other than shown on the original drawings or of sizes other than indicated. Clearly indicate such changes on a record set of

drawings to be provided to the Owner's Representative. Coordinate these record drawing requirements with Section 01770 - Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Installer is required to be a company specializing in work of this Section, defined as specialist with minimum five years documented company experience in landscape installations of a similar nature.

B. Installer lead shall be present at all times during execution of this portion of work and have five years of documented experience with landscape installations of a similar nature. This person shall also be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation. This person shall direct all work performed under this Section.

C. All workers will have a minimum one-year of documented Western Washington experience in landscape installations of a similar nature. These persons are to be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation.

1.5 PRE-INSTALLATION CONFERENCE

A. Prior to commencement of the work, meet onsite with the Owner's Representative to review the following:
   1. Existing condition of site soil preparation prior to planting operations
   2. Planting schedule and potential conflicts with work by other trades
   3. Quality control and maintenance

1.6 DELIVERY STORAGE AND HANDLING

A. Protect plant materials from dehydration, contamination and heating during delivery, storage, and handling.

B. Deliver branched plants with branches tied and exposed branches covered with material that allows air circulation. Untie branches as soon as possible, once delivered.

C. Prevent damage to root balls and desiccation of leaves. If there is any delay of more than one day in planting cover root balls with soil or mulch and keep moist.

D. Deliver fine lawn see mix in standard containers with the common name of see, lot number, net weight, percentage of purity, percentage of germination, percentage of weed seed content and inert material clearly marked for each kind of seed in accordance with applicable state and federal law.

E. Deliver fertilizer and lime to the site in original unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Store fertilizer and lime in a cool dry location away from contaminants.

F. Immediately remove from site plants which are not true to name or which do not comply with specified requirements.

G. Replace damaged plants at no additional expense to the Owner. Damaged plants will be rejected.

H. Label plants with scientific name, a minimum of two labels per flat for plants of the same type. All other plants to have individual labels.

1.7 INSPECTION

A. At Growing Site: Owner's Representative may inspect and/or tag plant material scheduled for this project at the growing site identified by the Contractor.

B. At the Job Site: The Owner's Representative will inspect plant materials at the time of delivery to the site, for conformance with requirements of plant schedules, plant specifications, storage and handling requirements. Remove rejected materials immediately from the site and replaced at no expense to the Owner. Provide a minimum three days notice of inspection to the Owner's Representative.

C. During Construction: The Owner's Representative reserves the right to reject non-conforming plant material at any time until completion of the warranty period.

1.8 SUBSTITUTIONS

A. Substitutions of plant materials will not be permitted unless authorized in writing by the Owner's Representative 45 days prior to scheduled start date of installation. If proof is submitted that a specified plant is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price.

B. Provide a minimum of two options for each substitution.

1.9 WARRANTY

A. Warranty: Warrant work of this Section for one year from the date of Physical Completion by the Owner's Representative. The warrantee to cover against defects of materials and workmanship.

B. Replace material within 30 days of awareness of plant death or abnormal growing condition or written notification by Owner or Owner's Representative and prior to expiration of warranty period.

C. Replace material with plants of identical species and size in normal healthy growing condition at end of warranty period.

D. Plants damaged by vandalism after Physical Completion or resulting from damage by Owner's occupancy of the site will not require replacement unless

improper installation is a contributing factor in the damage (e.g. improper staking, improper plant pit size, and improper protection).

E. A final inspection by the Owner's Representative will be scheduled at the end of the warranty period.

PART 2 PRODUCTS

2.1 ORGANIC COMPOST

A. Organic Compost: See Section 02910 Soil Preparation

2.2 PLANT MATERIALS

A. Plants will be nursery grown in climatic conditions similar to site and of a size at least equal to size specified, after necessary pruning and measured with branches in normal growing position.

B. Do not prune prior to site delivery, unless authorized in writing by the Owner's Representative.

C. Caliper measurement to be taken at a point on the trunk six inches above natural ground line for trees up to four inches in caliper.

D. Measurements, caliper, branching, grading, quality, balling and burlapping are to follow Code of Standards of American Association of Nurserymen in ASNS unless otherwise specified.

E. Trees and shrubs will have an overall form typical of the species and will be uniformly branched with a symmetrical crown. Trees with damaged leaders, damaged bark, sunscalds, disfiguring knots, circling or girdling roots, or fresh cut limbs over 3/4-inch will be rejected.

F. Container grown plants will have been grown in the containers in which they are delivered for at least six months, but not more than two years. Samples must prove no root-bound conditions exist. Root-bound plants and container plants that have cracked or broken balls of earth when taken from containers will be rejected except upon written approval by the Owner's Representative.

G. Balled and burlapped plants will have firm, uncracked, natural balls of soil in sizes shown in ASNS; will be wrapped firmly with burlap or approved material; and will be bound carefully with twine, cord, or wire mesh.

H. Replace rejected or damaged plants at no additional expense to the Owner.

2.3 HYDROSEEDING MATERIALS

A. Seed Mix: 75% Kentucky Bluegrass and 25% Fine Fescue
   1. See at a rate of 3 lb per 1000 sf.
   2. Replace seed which has become wet, moldy or otherwise damaged in transit at no additional expense to the Owner.

B. Fertilizer:Provide a total of one (1) pound of nitrogen from ammonium sulfate, one-half (1/2) pound of nitrogen from SCU, two (2) pounds of Phosphorus and two (2) pounds of Potassium per 1000 square feet. 10-20-20 at the rate of 435 pounds per acre and Sulfur Coated Urea (SCU) at the rate of 60 pounds per acre may be used.

C. Wood Fiber Mulch:100% fiber, manufactured by the defibrating process, from fir, hemlock or alder; containing no growth or germination inhibiting substances. A soil binding agent (tackifier) is required. Mulch will be uniform in weight and dyed a suitable color to facilitate visual measurement of placement.

D. Soil Binding Agent:Non-toxic, biodegradable materials, which are environmentally safe such as ESI - TAK or approved equal. Percentage of soil binding agent will be between 2% and 10%.

2.4 MULCH FOR PLANTING AREAS

A. Planting Bed Bark Mulch: Medium fir/hemlock mulch per Pacific Topsoils Inc. or accepted equal.

2.5 FERTILIZERS AND LIME

A. Phsophate-free and organic fertilizer and lime, with 50-percent nitrogen derived from slow release form. Select fertilizer based upon the test data analysis submitted under Soil Preparation 02910.

B. Furnish in standard unopened containers with weight, name of plant nutrients and manufacturer's guaranteed statement of analysis clearly marked, in accordance with state and federal laws. Apply fertilizer at the rate recommended by supplier.

C. Agricultural grade mineral soil conditioner lime containing at least 35-percent magnesium carbonate and 49-percent calcium carbonate with 100-percent passing U.S. No. 65 sieve as made by Kaiser Dolomite 65 AG or approved equivalent product.

2.6 TREE STAKING MATERIALS

A. Chainlock tree tie material: per plans.

B. Tree stakes: per plans.

PART 3 EXECUTION

3.1 GENERAL

A. Proceed with work as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.

B. Remove debris from other trades prior to beginning work.

C. Review existing prepared site conditions for contaminants that may have been discarded by other trades, such as thinner, paint, or plaster and notify the Owner's Representative immediately if contaminants are present.

D. Test planting pits shall be dug in 6 locations flagged by Owner's Representative. Pits shall be filled with water and observed for 24 hours. Confirm in writing to Owner's Representative that pits have drained within 24-hour period or notify that drainage is not occurring.

E. Remove all plant tags and flags prior to final inspection.

3.2 PLANTING

A. Plant trees, shrubs, and ground covers at the locations shown and in accordance with the Plans. Plant at normal planting season with bare root plants planted only from October to March, unless otherwise approved in writing by the Owner's Representative, and after major construction work is completed.

B. Place trees first, and follow with shrubs, then groundcovers.

C. Plant trees, shrubs and groundcover per details shown on plans.

D. Set plants in center of pits on compacted, approved amended site soil backfill mix and at the same relationship with finish grade after settlement as they bore natural grade.

E. Hold firmly in position and place backfill mixture carefully, filling voids and avoiding root damage. When hole is approximately two-thirds full, compact fill by watering to avoid air pockets.

F. Stake trees per details shown on Plans.

G. Install two-inch depth of mulch within plant beds. Provide smooth mulch surfaces.

H. Protect new plantings against harm from wind, unusual weather, foot traffic or other vandalism through Project Acceptance. Provide protection fencing as necessary.

I. Special planting techniques may be required by the Owner's Representative for unseasonal planting or prolonged periods of drought.

J. Water all plants immediately after planting.

K. As directed by the Owner's Representative, prune trees and shrubs for form and visual clearance. Prune only damaged branches under Owner's Representative's direction.

3.3 FERTILIZER

A. Apply fertilizers to tree, shrub, and ground cover planting areas at rates recommended from test results submitted in Soil Preparation 02910.

B. Amend entire planting bed areas as necessary.

3.4 MAINTENANCE

A. Maintain planting for a period of at least 60 days after completion of planting operations or until all plants are sufficiently recovered from transplanting and in a healthy growing condition acceptable to the Owner's Representative.

B. Maintenance includes cultivating, weeding, watering, pruning (only as directed by Owner's Representative), and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.

C. Reset settled plants to proper grade and position. Restore planting saucer and straighten, repair and adjust guy wires and stakes, as required.

D. Correct defective work as soon as possible, after deficiencies become apparent and weather and season permit.

E. Water trees, plants, and ground cover beds within the first twenty-four hours of initial planting, and not less than twice per week (including rain) until Physical Completion.

F. Owner's Representative will inspect planted areas to determine Physical Completion upon Contractor's request. Provide notification at least ten working days before requested inspection date.

G. Planted areas will be accepted provided all requirements, including the maintenance period have been complied with and plant materials are alive and in a healthy, vigorous condition.

H. Upon Physical Completion, the Owner will assume plant maintenance.

3.5 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

END OF SECTION

SECTION 32 91 13

SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furnish all material, labor, services, and related items required to complete work indicated on Drawings and specified herein. The work includes discing, amending, incorporation, and mixing to prepare the soil for tree, shrub, and groundcover and lawn planting, finish grading, and clean-up.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Contract Documents, including but not limited to the following:
   1. Section 32 80 80 Irrigation
   2. Section 32 90 90 Planting

1.3 REFERENCE STANDARDS

A. ASTM – American Society for Testing Material: D1557.91 – Test method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

B. USDA – United States Department of Agriculture: Texture Triangle Classification.

C. Agricultural Chemist: Qualified, experienced public or private soils testing laboratory, capable of providing test results as specified, and accepted by the Owner’s Representative.

1.4 SUBMITTALS

A. Submit the following samples:
   1. Topsoil: one-pound bag.
   2. Organic Amendment: one-pound bag.
   3. Crushed Rock: one-pound bag.

B. Equipment and methods of tilling.

C. Test Reports
   1. Employ, at Contractor's expense, an approved agricultural testing laboratory to perform wood chip testing.

1.5 PROJECT CONDITIONS

A. Soil Moisture Content: Do not work soil when moisture content is so great that excessive compaction will occur; or when it is so dry that dust will form in air or that clods will not break readily.

B. Keep streets, sidewalks, porous pavements and site clean, free from debris; and affected drains open and free flowing at all times. Protect drains with filter fabric covers during construction and throughout plant establishment period. Protect pavement areas from debris, sediment and/or dust. Use appropriate erosion control measures and ensure they are functional at all times.

PART 2 QUALITY ASSURANCE

2.1 GENERAL

A. All products supplied will comply with applicable state and local codes.

2.2 PRODUCTS

A. Top Soil: Soil mix shall consist of 2/3 specified sandy loam and 1/3 specified composted organic soil amendment material.

B. Sandy Loam
1. Sandy loam shall consist largely of sand, but with enough silt and clay present to give it a small amount of stability. Individual sand grains can be seen and felt readily. On squeezing in the hand when dry, it shall form a cast that will not only hold its shape when the pressure is released, but shall withstand careful handling without breaking. The mixed soil shall meet the following:

Screen Size	Percent Retained	Percent Passing
3/8-inch		100
#4	5	95
#10	15	85
#30	30	70
#60	50	50
#100	70	30
#270	85	15

2. Shall have pH range of 5.0 - 6.5 with dolomitic limestone added as necessary to attain this range.

C. Organic Compost:
1. Provide organic amendment that is pure composted plant waste, a well-decomposed, humus-like material derived from the decomposition of grass clippings, leaves, branches, wood and other organic materials, as

supplied by Cedar Grove, Inc. (877-764-5748), or accepted equal. The mix is to be composted for a minimum of one-year.

2. Provide composted plant waste that consists of 98 percent by volume, of material derived from the aerobic decomposition of recycled plant waste.
3. Composted plant waste is to meet the following physical criteria:
   a. 100-percent passing through a one-inch sieve
   b. pH range between 5.5 and 7.0.
   c. Carbon to nitrogen ration between 20:1 and 40:1.
   d. Contains less than two-percent foreign material (plastic, concrete, metal, etc.) on a dry weight basis
   e. Maximum electrical conductivity of 3.0 ohms/cm.
   f. Certified free of all plant parasitic organisms, viable weed seeds, heavy metals or parasitic residues.
   g. Moisture content with no visible free water or dust produced when handling the material.

D. Landscape Rock:
   1. 1/2 to 1-inch angular rock in Buckskin with no fines.

E. Geotextile Fabric:
   1. AOS: No. 30 max.
   2. Water permittivity: 0.02 sec^{-1} min.
   3. Grab tensile strength, min. in machine and x machine direction: 250 lbs/160 lbs min.
   4. Grab failure strain, in machine and x machine direction: 50%/50%
   5. Seam breaking strength: 220 lbs/180 lbs. min.
   6. Puncture resistance: 495 lbs/301 lbs min.
   7. Tear strength' min. in machine and x machine direction: 80 lbs/50 lbs min
   8. Ultraviolet (UV) radiation stability: 50% strength retained min., after 500 hours in weatherometer.

PART 3 EXECUTION

3.1 GENERAL

A. Review existing soil conditions for any contaminants that may have been discarded by other trades, such as thinner, paint, or plaster and notify the Owner's Representative immediately if any contaminants are present.

B. Protect prepared soils from disruption by other work and construction activities.

3.2 PREPARATION OF PLANTING AREAS

A. Prepare planting areas by removing eighteen inches of existing soil, including cobbles, rocks, and debris. Till in Cedar Grove topsoil in three lifts to match grade on plan once mulch and crushed rock are installed.

B. Place three-inch lift of specified organic compost and till to a depth of 12 inches.

C. Roll or hand compact soil to achieve compaction of 85-percent of dry weight density.

D. After natural settlement and light rolling, the complete work shall conform strictly to the lines, existing grades and elevations, and grade under the Contract without additional cost to the Owner.

E. Finish Grading of right-of-way landscape areas: Fine grade all prepared planting areas to existing grades and as specified within this Section, maximum 1/4-inch below the level of adjacent walks and curbs, unless otherwise noted. Intent is to minimize tripping hazards from grade changes after minor settlement of prepared planting soils. Elevations and landform configuration is critical to project design intent. Supply additional soil as needed to give the specified depths.

F. Thoroughly incorporate all organic compost into the native soil to assure uniform distribution.

3.3 INSPECTION

A. Notify the Owner's Representative at least 48 hours in advance of the time of inspection required for completion of subgrade depths, soil preparation and installation of organic compost before planting of trees, shrubs, and ground covers and prior to seeding or sodding of lawn areas.

3.4 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from soil preparation operations.

END OF SECTION